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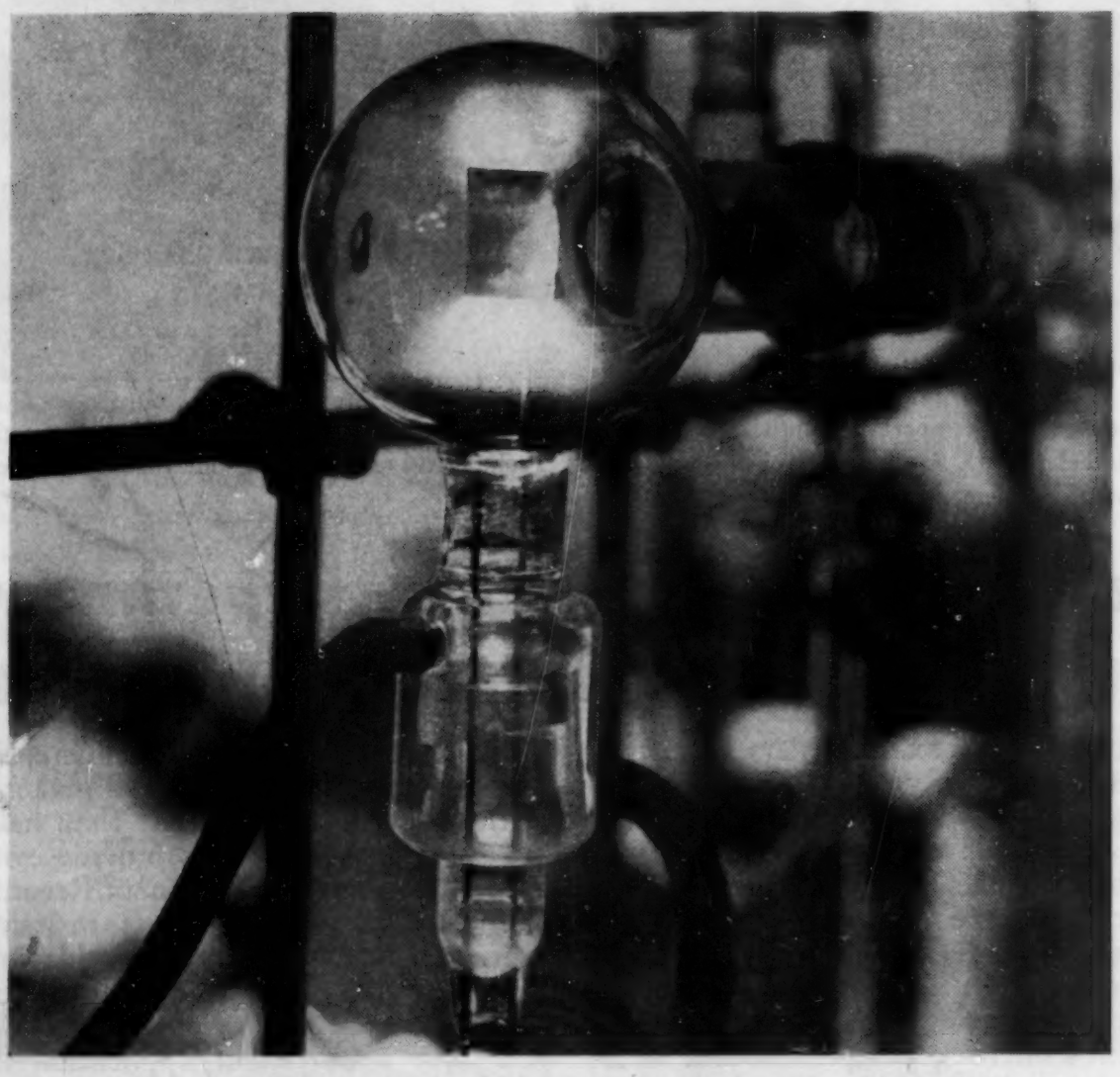

Small electric furnace in a vacuum system used to reduce compounds of plutonium to pure metal. This photograph by Fritz Goro is from one of the large panels in the exhibition on Atomic Energy prepared by the editors of *Life* Magazine for the American Association for the Advancement of Science, Stevens Hotel, Chicago, December 26–31.

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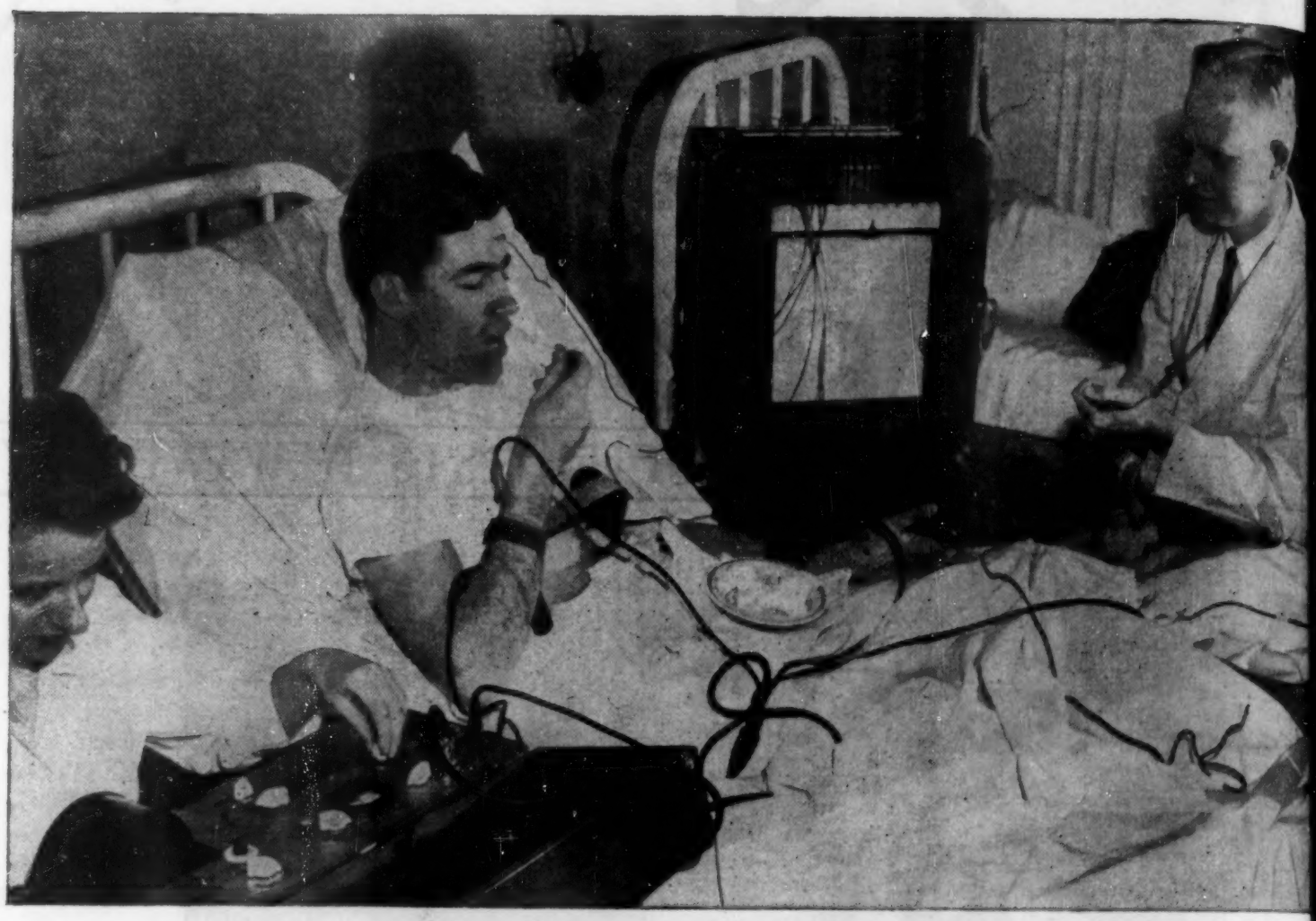
Preview of the 114th Meeting, AAAS

Chicago, December 26–31, 1947



For testing the effect of food temperature on the flow of blood, Dr. Austin Henschel (right), Assoc. Prof. of Physiological Hygiene at Univ. of Minnesota, uses a Speedomax Recorder to check skin temperature of a student eating ice-cream. Technician in foreground simultaneously takes electrocardiogram.

Speedomax Provides Busy Experimenter With Six Detailed Temperature Records

Speedomax or Micromax Recorders can often relieve a scientist of nearly all routine temperature-recording duties. The instrument leaves him free to "time" or otherwise supervise his experiment, because the Recorder collects whatever temperature data he requires. In the experiment pictured above, a Speedomax records temperature of ambient air and of the student's skin at toe, finger, upper arm, chest, and forehead. The instrument's micro-responsiveness and sensitivity give the record greater detail and accuracy than the best team of eye and hand could continuously provide.

For the experiment described here, the physiologist chose a Speedomax which makes the round of the six test points in less than half a minute. Other Speedomax models provide even faster response, and various Micromax Recorders are recommended when slower speeds are desired. Whatever your requirement, a suitable instrument is available. If a description of our Recorders will help you, catalogs are available on request. If you have a particular application in mind, an L&N engineer will be glad to provide more specific information. Address Leeds & Northrup Co., 4926 Stenton Ave., Philadelphia 44, Pa.

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review of the 114th Meeting, AAAS:

hicago, December 26–31, 1947

eneral Information

Sixty-five Association sections and affiliated societies ll present programs at the Chicago meeting. In addi-n, meetings have been scheduled for the organization two new scientific societies, one in the field of system-ic zoology and the other in the field of the social and onomic sciences, specifically the study of invention. ther groups, such as the Natural Resources Council of merica, Grassland Research Foundation, and Ecolo-sts' Union, are meeting jointly with related societies.

The physical arrangements for the meeting were made ith the help of Fred Puffer, of the Chicago Convention ureau, and local committees; in several cases arrange-ents were made by representatives of the cooperating cieties. Through the Convention Bureau the Associa-on obtained commitments for about 4,000 hotel rooms. ommitments for session rooms were obtained from the les managers of the Blackstone, Congress, Palmer ouse, Sherman, and Stevens Hotels. Officers of The niversity of Chicago generously provided meeting oms for societies desiring to meet on the campus of the niversity. In every case, societies having closely related terests have been assigned meeting rooms in the same adjacent hotels, in order that their members may ingle conveniently with a minimum of outdoor travel.

The following institutions in the Chicago area named epresentatives to organize the local committees: hicago Academy of Science, Chicago Historical Society, hicago Natural History Museum, Chicago Technical ocieties Council, DePaul University, Elmhurst College, eorge Williams College, Illinois Institute of Technology, ake Forest College, Museum of Science and Industry, ational College of Education, Northwestern University, oosevelt College, Saint Xavier College for Women, ohn G. Shedd Aquarium, University of Chicago, Uni-ersity of Illinois, and Wheaton College. At a meeting of ommittee members early in 1947, Paul Jenkins, secretary the Chicago Technical Societies Council, was elected eneral chairman. His tasks have been to coordinate the ctivities of the subcommittees and to serve as their ntermediary with the administrative officers of the ssociation. The five subcommittees are: *Finance*: W. P. Cortelyou, Roosevelt College, chairman; Gilbert . Force, Illinois Institute of Technology, treasurer; *quipment*: R. T. Van Niman, Chicago Technical ocieties Council, chairman; *Publicity*: Jeannette Lowrey, he University of Chicago, chairman; *Reception and ntertainment*: Margaret Scriven, Chicago Historical ociety, chairman; *Registration*: Hans O. Hoeppner, The University of Chicago, chairman. The general functions of these committees include raising funds to defray local committee expenses, providing equipment for the meetings of the sections and societies, aiding in the direction of press room activities, arranging for the general reception, and facilitating registration.

Reservations for sleeping accommodations may yet be made through the AAAS Reservation Center, Chicago Convention Bureau, 33 N. La Salle Street, Chicago 2. When writing for reservations, give your home address, dates of arrival and departure, and three hotels in order of preference. The hotel headquarters for all sections and societies meeting with the Association follow:

The Sherman Hotel will be the general headquarters of the Association, housing the Press Room (Parlors L, M, and O) and the business meetings of the Association.

Congress Hotel: American Association of Economic Entomologists, American Microscopical Society, American Society of Naturalists, American Society of Parasitologists, Beta Beta Beta, Ecological Society of America, Entomological Society of America, Society for the Study of Evolution, Society of Systematic Zoologists.

Continental Hotel: Econometric Society.

Palmer House: Section B (Physics), Section O (Agriculture), American Association of Physics Teachers, American Dietetic Association, American Meteorological Society, American Physical Society, American Society for Horticultural Science, Honor Society of Phi Kappa Phi, Philosophy of Science Association, Pi Lambda Theta, Potato Association of America, Society for Research in Child Development. (Meetings of Section B, American Association of Physics Teachers, American Meteorological Society, and American Physical Society will be held on the campus of The University of Chicago.)

Sherman Hotel: Section A (Mathematics), Section C (Chemistry), Section D (Astronomy), Section E (Geology and Geography), Section H (Anthropology), Section I (Psychology), Section K (Social and Economic Sciences), Section L (History and Philosophy of Science), Section M (Engineering), Subsection Nd (Dentistry), Subsection Nm (Medicine), Subsection Np (Pharmacy), Section Q (Education), American Chemical Society (Chicago Section), American Nature Study Society, Cooperative Committee on Science Teaching of AAAS, National Association of Biology Teachers, National Science Teachers Association, Pi Gamma Mu, Research Council on Problems of Alcohol, Sigma Delta Epsilon, Society of the Sigma Xi.

Stevens Hotel: Section F (Zoology), Section G (Botany), American Fern Society, American Phytopathological

Society, American Society of Plant Physiologists, American Society of Professional Biologists, American Society of Plant Taxonomists, American Society of Zoologists, Biometric Society (Eastern North American Region), American Statistical Association (Biometrics Section), Botanical Society of America, Inc., Genetics Society of America, Herpetologists League, Limnological Society of America, Mycological Society of America, Phycological Society of the Americas, Sullivant Moss Society.

The main registration center will be located adjacent to the Exposition Hall in the Stevens Hotel and will be open from 8:30 A.M. to 9:00 P.M. daily. Hours for *supplementary registration desks* in other hotels are: *Congress Hotel*, Monday and Tuesday, December 29 and 30, 8:30 A.M. to 5:00 P.M.; *Palmer House*, Monday and Tuesday, December 29 and 30, 8:30 A.M. to 5:00 P.M.; *Sherman Hotel*, Friday, December 26 through Wednesday, December 31, 8:30 A.M. to 9:00 P.M.

The registration fee is $2.00 for members and college students and $3.00 for nonmembers. Upon payment of the correct registration fees, members and guests will receive copies of the *General Program* and Convention Badges. Display of the AAAS Convention Badge is required for admission to the scientific sessions of nearly all sections and societies.

Advance registrants who have received their programs and badges prior to the meeting are asked to call at the AAAS *Information Desk* in the main registration area, in the Stevens Hotel, where maps and special literature may be obtained which will guide the visitor about Chicago. Other desks for the sale of meal tickets for breakfasts, luncheons, and dinners sponsored by the affiliated societies will be found in the main registration area, as well as booths for the distribution of tickets to entertainment features. Persons who did not receive definite hotel reservations at the time of advanced registration should, on their arrival, notify the attendant at the Information Booth in the Stevens Hotel of their local addresses for posting in the Visible Directory.

The Visible Directory will be located in the Stevens Hotel, basement elevator lobby, adjacent to the registration desks, and will be open for inspection 24 hours a day. The Registration Cards of all who register will be in the Visible Directory.

Mail and telegrams addressed in care of the AAAS will be delivered by the Post Office and wire services to the AAAS Information Desk in the Stevens Hotel. While every effort will be made to notify addressees who are listed in the Visible Directory, the Association assumes no responsibility for the delivery of mail and telegrams. Items not called for will be returned to the sender at the close of the meeting, December 31. Telephone and personal messages will be filed alphabetically at the AAAS *Information Desk*, which may be reached by telephone through the Stevens Hotel.

Transportation facilities are abundant in Chicago—streetcar, bus, subway, elevated, and taxi. Economic travel in the "Loop Area," in which most of the meeting will be held, may be made for 10¢ car fare. Maps of the "Loop Area" will be available for ready orientation (see General Program). Members of societies meeting on the campus of The University of Chicago may travel from the "Loop" to the 59th Street Station on the Illinois Central Railway at a fare of 11¢ one way, 20¢ round trip.

Press Service. All persons who will deliver addresses or present papers at the Chicago meeting are requested to provide the Press Service with copies of abstracts of their papers as far as possible in advance of the meeting. Complete manuscripts are required of papers presented by *officers* of the Association and by *officers* and *invited speakers* appearing on the programs of the affiliated and associated societies. All abstracts and manuscripts available in advance of the meeting should be sent to the AAAS Press Director, Dr. Sidney Negus, Medical College of Virginia, Richmond, preferably before mid-December so that copies may be mailed to the science writers in time for them to examine and interpret the subject matter and to seek authoritative advice if necessary.

The Press Room at the Chicago meeting will be in the Sherman Hotel, Parlors L, M, and O, and will be equipped with duplicating machines to reproduce copies of papers delivered to the Press Director during the meeting, as well as with tables, bulletin boards, telephone outlets, reference texts, etc., to facilitate the work of the science writers. A pneumatic tube system for handling wire service is installed in the Sherman Hotel.

AAAS Business Sessions

The Executive Committee of the Association's Council will hold its first session in the Administrative Secretary's suite at the Sherman Hotel at 10:00 A.M. on Saturday, December 27.

The Council of the Association will meet on Sunday, December 28, at 3:00 P.M., in the Club Room of the Sherman Hotel. A second session of the Council will be held in the Club Room at 9:00 A.M. on Tuesday, December 30.

The Academy Conference will be held in Room 110 Sherman Hotel, at 4:00 P.M. on Saturday, December 27. Conferees will discuss the development of scientific personnel for industry and educational institutions, full subsistence science scholarships, the influence of academies on better science teaching, and the obligation of the State Academy to the Junior Academy. At 6:00 P.M. the group will attend the Academy Conference Dinner sponsored by the AAAS.

AAAS Prize Awards

The Annual One Thousand Dollar Prize, established in 1923, will be awarded to the author of a notable contribution to science presented on a regular program of the Chicago meeting. The Prize will be awarded upon the

ecommendation of the Prize Committee: Fernandus ayne (zoology), Indiana University, chairman; Malcolm ole (chemistry), Northwestern University; A. J. empster (physics), The University of Chicago; and illiam R. Taylor (botany), University of Michigan. t is not necessary that the prizewinner be a member of he Association. All papers appearing in the *General rogram*, except presidential and vice-presidential ddresses and invited papers, are eligible for the Prize.

The AAAS-George Westinghouse Science Writing wards will be presented at a ceremony to be held in the est Ballroom of the Stevens Hotel at 6:15 P.M. on aturday, December 27. Awards of $1,000 each will be ade to two writers, one for superior science reporting newspapers, the other for an article on science published a magazine. The judges of the awards are: H. L. encken, of the Baltimore *Sun* papers; Benjamin M. cKelway, editor, Washington *Star*; Edward Weeks, ditor, *Atlantic Monthly*; Clifton Fadiman, literary itic; Rudolf Flesch, author of *The art of plain talk*; enneth Olson, dean, Northwestern University School f Journalism; Edward Weidlein, director, Mellon nstitute; Detlev W. Bronk, chairman, National Re-earch Council; and Morris Meister, principal, Bronx igh School of Science, chairman of the Committee of udges.

The First International Salon, "Photography in Science," ponsored by *The Scientific Monthly* and the Smithsonian nstitution, is under way. For judging on October 27, ompetitors from 38 states and 3 foreign countries sub-mitted 361 prints, 243 in the black-and-white division nd 118 in the color division. Most of the prints were on isplay during November in the Arts and Industries uilding of the Smithsonian Institution of Washington. uring the Chicago meeting they will be shown at the nternational Science Exhibition in the Stevens Hotel. ater they may be seen at the Buhl Planetarium, ittsburgh, and at the Cranbrook Institute of Science, loomfield Hills, Michigan. In the color division first lace was awarded to Thomas C. Poulter, Armour Re-earch Foundation; in the black-and-white division first lace went to Edwin R. Willis, The Ohio State niversity.

AAAS Special Sessions

At each of its annual meetings the Association sched-ules a number of special sessions for the presentation of broad surveys of important fields of science. On Saturday morning, December 27, the Office of Naval Research (ONR) will present a report to scientists on research and Navy policy, Admiral Paul F. Lee, Chief, ONR, presid-ing. The ONR-University sciences programs will be reviewed, followed by a discussion led by Karl T. Compton, president of M.I.T.

On Saturday afternoon, December 27, the annual National Geographic-AAAS illustrated popular lecture will feature Harold F. Weaver in a report of the Brazilian Eclipse Expedition. Colored motion pictures will show the total eclipse of the sun and the preparations made by the Expedition to observe it in Brazil.

James B. Conant, president of Harvard University, will deliver his address as retiring president of the Association, on Saturday evening, December 27. The subject of Dr. Conant's address will be, "The Role of Science in Our Unique Society." Members of the Executive Committee of the Association and eminent scientists and citizens of Chicago have been invited by the Local Committees to be present on the Speaker's Platform. Following the address, the officers of the Association and the Chicago hosts for the occasion will receive members and guests at a general reception to be held in the Louis XVI Room of the Sherman Hotel. All members and guests of the Association are cordially invited to attend the Presidential Address and the Reception which will follow it.

On Sunday evening, December 28, the AAAS Cooperative Committee on Science Teaching will present a forum on "The Effectiveness of Science Teaching." The forum is based on a report by the Committee to the President's Scientific Research Board. Topics to be discussed will be the shortage of scientific personnel, particularly of science teachers, and methods for making up the deficiencies. Karl Lark-Horovitz, General Secretary of the Association and chairman of the Cooperative Committee, will preside. The panel of participants includes Philip Powers, R. W. Lefler, Morris Meister, Raleigh Schorling, Glen Blaydes, and L. V. Domm.

A full day's symposium on "Science in National Affairs" has been arranged for Monday, December 29. At the morning session, which will be devoted to "Atomic Energy Developments," W. Zinn will discuss "Developments of Atomic Energy at the Argonne National Laboratory"; L. J. Haworth will report on "The Brookhaven Laboratory and Plans for Fundamental Research in the Atomic Energy Commission"; Paul Aebersold will discuss "Radioactive Isotopes and Their Application to Peacetime Use of Atomic Energy"; and Philip Morrison will give an "Appraisal of Atomic Energy Progress."

The Monday afternoon session has been built around the President's Scientific Research Board Reports. E. U. Condon, National Bureau of Standards, will interpret the reports in relation to the "Federal Research Program in the Civilian Agencies." L. R. Hafstad will report similarly on the "Federal Research Program in the Armed Services." W. W. Lambert and D. W. Bronk will describe, respectively, "The Administration of Federal Research" and "The National Medical Research Program."

National Welfare and Science will be the theme of the evening session on "Science in National Affairs." J. Donald Kingsley, will speak on "Scientists and Federal Research," followed by W. W. Waymack, member of the

U. S. Atomic Energy Commission, whose subject will be "Scientists and the Atomic Energy Program."

On Tuesday morning, December 30, a symposium on "Insuring Adequate Scientific Personnel Resources" will be presented under the auspices of the National Security Resources Board, Executive Office of the President. The schedule of titles includes "Forecasts of Probable Supply and Demand," by Ewan Clague, Bureau of Labor Statistics; "Programs for Full Utilization of Present Resources," by A. H. Hausrath, Office of Naval Research; "Promising Innovations in University Programs to Meet Current Demands," by A. B. Bonds, Jr., President's Commission on Higher Education; and "Needed Adjustments in University Plans and Programs to Meet Long Range Needs," by Arthur Adams, Provost, Cornell University.

On Tuesday evening, December 30, the AAAS-Sigma Xi lecture will be presented by Glenn T. Seaborg in the Grand Ballroom of the Sherman Hotel. Dr. Seaborg will address the meeting on "The Eight New Synthetic Elements."

Programs of the AAAS Sections and the Societies

Section A (*Mathematics*) and the *Institute of Mathematical Statistics* will meet jointly in sessions for contributed papers on Monday and Tuesday, December 29 and 30. R. E. Langer, retiring vice-president of the Section, will present an address on "The Solution of Differential Equations in the Presence of Turning Points" at the Monday afternoon session.

Section B (*Physics*) will present two symposia jointly with the *American Physical Society* on Monday and Tuesday, December 29 and 30: "High Altitude Research by Rockets" and "The Physics of Polymers of Biological Interest." On Tuesday afternoon, L. A. DuBridge, retiring vice-president of the AAAS and chairman of Section B, will speak on "The Physics of Radar." In addition to contributed papers, the program of the American Physical Society includes invited papers of the Division of High-Polymer Physics. Among titles selected at random from the program of the APS are: "Beta Spectra of Cu(64) as a Test of the Fermi Theory," "Introduction of Two Neutrons Into Atomic Nuclei Under H(3) Bombardment," "Adsorption Analysis of High-Molecular Substances," "Radioactive Selenium 73 and 75," "The Effects of Pile Bombardment on Uncured Elastomers," "Mesotrons in the Stratosphere," "The Magnetic Susceptibility of Uranium Oxalate," "Dynamic Mechanical Properties of Rubber-like Materials," "Low-Temperature Transformations in Lithium and Some of Its Alloys," "Theoretical Analysis of the Effect of Imperfections in Diffraction-Gratings," and "Absorption of Microwaves by Hydrogen Atoms." The American Physical Society will also participate jointly with the American Association of Physics Teachers in the presentation of a symposium on "Microwaves and The Uses." All meetings of the physical science societies will be held at The University of Chicago.

The American Association of Physics Teachers and the *American Physical Society* will also meet jointly for a dinner session at the International House, The University of Chicago, 7:00 P.M., Tuesday, December 30. Paul E. Klopsteg will present the evening address, "Bows and Arrows." The general business session of the Society will be held in Kent Theater on Tuesday morning, December 30. At this session Marsh M. White will discuss "The Utilization of Physicists by the Army of World War II." In addition to a program of contributed papers to be presented on Monday afternoon and the joint session with the American Physical Society, the American Association of Physics Teachers will meet jointly with the AAAS Section on Physics at the Oriental Institute, Tuesday afternoon, December 30.

The American Meteorological Society plans to meet on Monday morning and afternoon and Tuesday morning, December 29 and 30. In addition to contributed papers, the Monday afternoon session will be a symposium on "Experimental Meteorology and Instrumentation." All meetings will be held in Room 122, Social Science Research Building, 59th Street near University Avenue, The University of Chicago.

Sigma Pi Sigma will hold its annual luncheon in conjunction with the meeting of the American Physical Society at 12:30 P.M., Tuesday, December 30, in the Quadrangle Club of The University of Chicago. Advance reservations may be made by writing to M. W. White, Executive Secretary of the Sigma Pi Sigma, Physics Department, Pennsylvania State College, State College, Pennsylvania. During the meetings tickets may be obtained at the registration desk in the Palmer House Hotel until 10:00 A.M., Tuesday morning.

Section C (*Chemistry*) will meet jointly with the American Chemical Society, Chicago Section, on Friday, December 26. Special symposia sponsored by the Section will be held on Friday afternoon, and Saturday and Sunday mornings and afternoons. These include "Industrial Processes," "Mechanisms of Hydrocarbon Reactions," and "Photosynthesis." The symposium on "Photosynthesis" is divided into three subheadings: "Mechanisms in Photosynthesis," "Isotopic Tracers in Photosynthesis," and "Quantum Efficiencies in Photosynthesis." Titles of the program of Section C selected at random include: "Attempts to Synthesize Large Conjugated Ring Systems," "Some Recent Developments in Antibiotics," "Free Radical Additions to Unsaturated Compounds," "The Mechanism of Isomerization of Saturated Hydrocarbons," "The Addition of Aromatic Compounds to the Carbon-Carbon Double Bond," "Chlorophyll Studies," "Chlorophyll Formation and Related Processes," "Theories of Photosynthesis," "Problems in Photosynthesis." The Section will hold a luncheon

ach day of the meeting period and jointly with the American Chemical Society, Chicago Section, on Friday.

The American Chemical Society, Chicago Section, will hold its annual meeting jointly with the AAAS Section on Chemistry (C) on Friday, December 26. Sessions will be held on Agricultural and Food Chemistry, Chemical Education, Industrial and Engineering Chemistry, Organic Chemistry, Petroleum Chemistry, Radiochemistry, Biological and Pharmaceutical Chemistry, Physical Chemistry, and Inorganic and Analytical Chemistry. Titles from among these sessions include: "A New Method for Determining Storage Changes and Quality of Foods," "Science in Liberal Education," "Destructive Alkylation of Hydrocarbons," "Polymerization of Olefins in Cracked Gases," "A New Radioactive Series," "Progress in Histamine and Antihistamine Research," "A New Method for the Titration of Basic Groups of Amino Acids and Proteins," and "Statistical Analysis of Physical Constant Data of Hydrocarbons." All meetings will be held in the Sherman Hotel.

Section D (*Astronomy*) will meet on Friday and Saturday, December 26 and 27, at the Sherman Hotel. The Friday afternoon session includes such titles as "On the Origin of Meteorites" and "A Theory of the Origin of Cosmic Rays." On Saturday morning G. Van Biesbroeck will present an address as retiring vice-president of the AAAS and chairman of Section D, entitled "The Einstein Shift in the Sun's Gravitational Field." A symposium on "The Origin of the Earth" will be held on Saturday afternoon, F. R. Moulton, presiding. The titles include "Facts of Geology and the Origin of the Earth," "Structure of Earth's Interior and the Origin of the Earth," "Elements in Meteorites and the Earth's Origin," "Theories of the Origin of the Earth," and "A New Theory of the Origin of the Earth." This symposium will be held jointly with the AAAS Section on Geology and Geography.

Section E (*Geology and Geography*) will meet on Friday and Saturday, December 26 and 27. The Friday sessions will be devoted to a symposium on "Problems of Mississippian Stratigraphy and Correlation," and the Saturday sessions to "Methods of Ground-Water Investigation." A joint session will also be held on Saturday afternoon with the Section on Astronomy (see above). On Friday afternoon John L. Rich will present an address as retiring vice-president of the AAAS and chairman of Section E, on "Goals and Trends in Geological and Geographical Research." Among the papers to be presented at the sessions are "Status of Mississippian Stratigraphy in the Appalachian Region," "Problems of Mississippian Stratigraphy in Southwestern United States," "Paleontological Comparison of American and European Mississippian Sections," "Ground-Water Exploration by the Electrical Resistivity Method," and "The Use of Soil Maps in Ground-Water Investigations in Indiana."

Section F (*Zoological Sciences*) will hold no formal sessions of its own aside from a brief business meeting at 12:00 noon, Tuesday, December 30, in the French Room, Blackstone Hotel, and the retiring address of the vice-president of the AAAS and chairman of Section F, Franz Schrader. Dr. Schrader will speak on "Three Quarter-Centuries of Cytology," following the Zoologists' Dinner Tuesday evening.

The American Association of Economic Entomologists will meet Saturday through Tuesday, December 27–30, at the Congress Hotel. The opening joint session with the Entomological Society of America on Saturday afternoon will be on training teachers in entomology, methods of teaching entomology, and the professional placement of graduate students in entomology. Running concurrently with this session will be the AAEE Section of Insecticides, including the chemistry, bioassay, formulation, and manufacture of insecticides. On Saturday evening the Section of Extension will meet concurrently with a session on Insecticides and Equipment. On Sunday morning Ernest N. Cory, president of the AAEE, will address a joint session with the Entomological Society of America on "Totalitarian Insects." Immediately following the address, a meeting will be held on "Insects Affecting Livestock and Man." In the afternoon this meeting will be continued concurrently with meetings of the Section of Plant Pest Control and Quarantine, Section of Apiculture, and a session on "Insects Affecting Miscellaneous Crops." The Entomologists' Banquet will be held in the Casino Room of the Congress Hotel on Sunday evening, December 28. On Monday morning Stephen S. Easter, of the United Nations Food and Agriculture Organization, will present a general address which will be followed by a symposium on "The Toxicity of Insecticides to Plants, and Animals Other Than Man." Three concurrent sessions will be held Monday afternoon: "Administrative Problems of Airplane Application of Insecticides," "Insects Affecting Fruit Crops," and "Insects Affecting Cereal and Forage Crops." Alfred E. Emerson, of The University of Chicago, will address a joint session with the Entomological Society of America on Monday evening, December 29. The title of Dr. Emerson's address is "The Zoogeography of the Termite." The final sessions on Tuesday afternoon include a symposium on the "Effects of Insecticides on Biological Control" and contributed papers on "Insects Affecting Truck and Vegetable Crops."

The American Society of Parasitologists will hold its 22nd annual meeting on Monday and Tuesday, December 29 and 30, at the Congress Hotel. Monday's sessions will be devoted to contributed papers. The principal paper of the Tuesday morning session will be an address by Harley J. Van Cleave, president of the American Society of Parasitologists. Dr. Van Cleave will speak on "Expanding Horizons in the Recognition of a Phylum." The Parasitologists' Luncheon will be held at

12:30 P.M. in the Stevens Building Restaurant, 17 N. State Street. The annual business session will be held in the Francis I room of the Congress Hotel at 1:30 P.M., followed by a demonstration program commencing at 3:00 P.M. General papers on parasitology will form the bulk of the morning's program on Wednesday, the concluding session in the afternoon being a symposium on "Exoerythrocytic Forms of Malarial Parasites."

The American Society of Zoologists will meet Monday through Wednesday, December 29–31, at the Blackstone Hotel. Concurrent sessions on Monday morning include "Cytology and Cellular Physiology," "Embryology," "Endocrinology," "General Physiology," and a joint symposium with the American Society of Naturalists, *et al.*, on the "Genetics of Microorganisms." The Monday afternoon session will be held jointly with the Genetics Society of America for the presentation of a symposium on "Plasmagenes, Genes, and Characters in *Paramecium aurelia*." Four concurrent sessions have been planned for Tuesday morning: "Cytology," "Embryology," "Endocrinology," and "General and Cellular Physiology." The annual business meetings of Section F and the Society will be held at 12:00 noon in the French Room of the Blackstone Hotel. A general demonstration program will be held in Room 24, Hull Zoological Laboratory, The University of Chicago, on Tuesday afternoon, and motion pictures will be shown in Room 14. At 3:00 P.M. the motion-picture program will be repeated in Room 106 of the Hull Botanical Laboratory. The Zoologists' Dinner will be held in the Crystal Ballroom of the Blackstone Hotel at 7:00 P.M. on Tuesday, December 30. Franz Schrader, chairman of Section F, AAAS, will speak on "Three Quarter-Centuries of Cytology." On Wednesday morning there will be concurrent sessions on "Cellular Physiology and Protozoology," "Embryology and General Morphology," "Evolution and Ecology," and "General Physiology." The closing session on Wednesday afternoon will be a joint symposium with the Genetics Society of America on "Methods for the Genetic Improvement of Farm Animals."

The Entomological Society of America will hold its 42nd annual meeting from Saturday through Monday, December 27–29, at the Congress Hotel. In addition to the joint sessions enumerated under the American Association of Economic Entomologists, there will be an Executive Committee meeting on Saturday evening, sessions of contributed papers Sunday morning and afternoon, a session on "Taxonomy and Physiology" Monday afternoon, a joint session with the Ecological Society of America on Tuesday morning, and a Business Session on Tuesday afternoon. The annual Entomologists' Banquet will be in the Casino Room, Congress Hotel, Sunday evening, December 28.

The Herpetologists League will hold one joint session with the Ecological Society of America on Monday at 2:00 P.M. in the Casino Foyer of the Congress Hotel.

The Society of Systematic Zoologists has scheduled a preliminary meeting in Parlor D of the Congress Hotel on Monday morning, December 29, to consider the organization of a society of animal taxonomists. All individuals interested in the proposed society are cordially invited to attend. On Monday afternoon Dr. Francis Hemming, secretary of the International Commission on Zoological Nomenclature, will address a meeting to be held at 3:30 in the Upper Tower Room of the Stevens Hotel. Dr. Hemming's visit to this country is under the auspices of the Smithsonian Institution, Washington, D. C.

The American Microscopical Society will hold a luncheon for its Executive Committee at 1:00 P.M. on Monday, December 29, in the Pompeian Room of the Congress Hotel. On Wednesday at 4:00 P.M. the 64th annual meeting will be held in the Casino Foyer of the Congress Hotel.

The American Society of Naturalists will meet on Monday, December 29, and Wednesday, December 31, in the Congress Hotel. The program of the 63rd annual meeting includes a symposium on "The Genetics of Microorganisms," to be held on Monday morning in the Stevens Hotel, H. A. Rodenhiser presiding. The papers include "Mutations in Viruses," by W. M. Stanley and C. A. Knight; "Bacteriophage Mutations and Interactions Between Bacteriophage Particles Inside the Host Cell," by S. E. Luria; "Spontaneous and Induced Mutations in Bacteria," by M. Demerec; "Chromosome Behavior in *Neurospora* During Ascosporogenesis," by B. McClintock and J. R. Singleton; "Genetics of the Smut and Rust Fungi," by E. C. Stakman; and "Inheritance of Pathogenicity in *Venturia inaequalis*," by G. W. Keitt. Participating in this session are the American Phytopathological Society, American Society of Zoologists, Botanical Society of America, Ecological Society of America, National Research Council Committee on the Genetics of Microorganisms, and Society for the Study of Evolution.

The Biologists' Smoker, sponsored by the American Society of Naturalists, will be held in the Chicago Natural History Museum, Monday, December 29, at 9:00 P.M. All biologists are cordially invited to attend. Refreshments will be available. Since city bus service to the Museum is suspended at 6:30 o'clock daily, special bus transportation will be provided for the smoker. At 10-minute intervals between the hours of 9:00 P.M. and 12:00 P.M. buses will leave for the Chicago Natural History Museum (Field Museum) from in front of the Stevens Hotel, and also for return from the Museum to the Stevens Hotel. Bus tickets may be purchased at the ticket booth located in the registration area of the Stevens Hotel. On Wednesday morning the Naturalists will meet jointly with the Ecological Society of America and the Society for the Study of Evolution, for a round-table discussion on "Bird and Mammal Population Mechanisms." The Florentine Ballroom, Congress Hotel,

will be the site of the Naturalists' Dinner on Wednesday at 6:00 P.M.

Beta Beta Beta Biological Fraternity will hold a luncheon session in the North Pompeian Room, Congress Hotel, at 1:00 P. M. on Monday, December 29.

The Biometric Society (Eastern North American Region) will meet jointly with the Biometrics Section of the American Statistical Association on Friday and Saturday, December 26 and 27, at the Stevens Hotel.

The Biometrics Section of the American Statistical Association will present a joint symposium with the Biometric Society on "Mathematical Biology." Representative papers include "Recent Advances in Mathematical Biophysics," "Mathematics in Radiobiology," "Mathematical Theory of Perception," "The Kinetics of Blood Coagulation," and "The Physical Aspect of Organic Evolution."

The Ecological Society of America will hold its 32nd annual meeting from Monday to Wednesday, December 29–31, at the Congress Hotel. Three concurrent sessions on Monday morning will include "Plant Ecology," "Animal Ecology," and a joint symposium with the American Society of Naturalists, *et al.*, on "The Genetics of Microorganisms." The Monday afternoon program includes joint sessions with the Herpetologists League, the Botanical Society of America, and the Committee for the Study of Animal Societies. Tuesday morning's concurrent sessions include "Plant Ecology" and a joint meeting with the Entomological Society of America; the afternoon sessions include a joint meeting with the Society for the Study of Evolution, "Applied Ecology," and the annual business meeting of the Society at 4:00 P.M. in the English-Walnut Room of the Congress Hotel. The dinner of the Ecological Society of America will be held in the Florentine Ballroom of the Congress Hotel on Tuesday at 7:30 P.M. The Wednesday morning sessions include joint sessions with the American Society of Naturalists and Society for the Study of Evolution ("Bird and Mammal Population Mechanisms"), the Limnological Society of America (symposium on "Bottom Sediments"), and the Natural Resources Council of America (symposium on "Conservation and a Stable Society"). The final concurrent sessions on Wednesday afternoon include "Animal Ecology," symposium on "The Biota of Mexico and Guatemala," the business meeting of the Grassland Research Foundation, and the business meeting of the Ecologists' Union.

The Genetics Society of America will meet Monday through Wednesday, December 29–31, at the Stevens Hotel. The opening session on Monday morning will be a joint symposium with the American Society of Naturalists, *et al.*, on the "Genetics of Microorganisms." A joint symposium with the American Society of Zoologists will be held in the afternoon on "The Plasmagenes, Genes, and Characters in *Paramecium aurelia*." On Tuesday the Society will meet on the campus of The University of Chicago for sessions of short papers in Mandel Hall, morning and afternoon, and a demonstration program in Room 13 of the Zoology Building. Concurrently with the morning sessions at the University, the Genetics Society is sponsoring a joint symposium on "Natural Hybridization" with the Society for the Study of Evolution, in the Congress Hotel. The annual luncheon and business meeting will be held in Hutchinson Commons, The University of Chicago, at 12:00 noon, Tuesday. Sessions on the last day of the three-day meeting period will be held in the Stevens Hotel. The morning session will consist of short papers and the afternoon session will be a symposium on "Methods for the Genetic Improvement of Farm Animals," held jointly with the American Society of Zoologists.

The Limnological Society of America will meet Monday through Wednesday, December 29–31. Monday's sessions of contributed papers will be held at the Chicago Natural History Museum. On Tuesday the Society will meet jointly with the AAAS Section on Engineering for the presentation of a symposium on "Limnological Aspects of Water Supply and Waste Disposal," at the Stevens Hotel. The sessions on Wednesday will be held in the West Ballroom of the Stevens Hotel, the morning program being a symposium on "Bottom Sediments," held jointly with the Ecological Society of America, and the afternoon being devoted to general papers.

The National Association of Biology Teachers will meet Sunday through Tuesday, December 28–30, at the Sherman Hotel. From 9:00 A.M. to 3:00 P.M., Sunday, the Association will participate with the American Nature Study Society in a joint field trip to Dune State Park. The two societies will reconvene Monday afternoon in the Sherman Hotel for a panel discussion on "What Is Resource-Use Education and How Does It Fit Into Our School Program?" On Tuesday a joint symposium on "Teaching Behavior in High School Biology" with the American Nature Study Society will be held in the morning and afternoon, followed by the Biology Teachers' Dinner in the evening. Dr. A. L. Windsor will address the dinner session on "The Selection and Maintenance of Science Teachers."

The National Research Council Committee on the Genetics of Microorganisms is sponsoring with the American Society of Naturalists, *et al.*, a symposium on "The Genetics of Microorganisms," Monday morning, December 29, in the Stevens Hotel. Members of the Committee include H. A. Rodenhiser, chairman, M. Demerec, H. H. McKinney, A. J. Riker, E. C. Stakman, and W. H. Taliaferro.

The Society for the Study of Evolution will meet Monday through Wednesday, December 29–31, at the Congress Hotel. In addition to papers on zoology Monday afternoon and on botany Wednesday afternoon, the Society will jointly sponsor 5 symposia: "Genetics of Microorganisms," Monday morning; "Natural Hybridization"

and "Evolution and Classification of Angiosperms," Tuesday morning; "Evolution and Classification of Gymnosperms," Tuesday afternoon; and "Bird and Mammal Population Mechanisms," Wednesday morning. J. T. Patterson, L. R. Dice, H. N. Andrews, Thomas Park, Aldo Leopold, and Howard K. Gloyd will serve as presiding officers.

The American Society of Professional Biologists will meet on Sunday afternoon in Private Dining Room 4, Stevens Hotel, to discuss objectives and future plans of the Society. All biologists are cordially invited to attend.

Section G (*Botanical Sciences*) will hold a joint session with all plant science societies on Saturday afternoon, December 27, in the North Ballroom, Stevens Hotel. Walter F. Loehwing, as chairman of the Section on Botany, will present the AAAS vice-presidential address, entitled "The Developmental Physiology of Seed Plants." Also scheduled on the afternoon program are: "Correlations Between Growth, Metabolism, and Salt Accumulation," by F. C. Steward; "Nutrient Requirements of Fungi," by W. J. Robbins; and "Correlation at the Community Level," by Paul B. Sears.

The American Fern Society, in addition to participating in the joint session with Section G, will hold a single session on Saturday morning, December 27, in Room 20, Stevens Hotel. R. M. Tryon, Jr., will present a paper on "Ferns of the Sleeping Giant, Thunder Bay, Ontario," followed by a round-table discussion on "Recent Discoveries; Range Extensions," with a display of fern specimens.

The American Phytopathological Society will meet Saturday through Tuesday, December 27–30, at the Stevens Hotel. Business meetings will be held on Saturday. The general sessions will commence Sunday afternoon with concurrent programs on "Diseases of Corn and Small Grains," and "Diseases of Fruits and Ornamentals." The Monday morning meetings include a "Fungicide Colloquium" and contributed papers on "Diseases of Field Crops" and "Virus Diseases." The phytopathologists are also cosponsoring a meeting with the American Society of Naturalists, *et al.*, on Monday morning on the "Genetics of Microorganisms." The afternoon sessions are on "Breeding and Disease Resistance," "Market Diseases of Fruits and Vegetables," "Extension Workers Conference," and "Plant Disease Survey Conference." The Chicago Bar Association will be the site of the Phytopathologists' Dinner, Monday evening. Two concurrent sessions will be held on Tuesday morning, "Antibiotics and Bacterial Diseases" and a joint meeting with the Potato Association of America. "Virus Diseases of Vegetables" and "Vegetable Diseases" will constitute the afternoon programs. The concluding sessions on Tuesday evening will include miscellaneous papers and a round-table discussion of National Security.

The American Society of Plant Physiologists will meet Saturday through Tuesday, December 27–30, at the Stevens Hotel. All sessions will be joint with the Physiological Section of the Botanical Society of America. Representative papers include "Uraform, Phosphate Rock, and Expanded Vermiculite as Nutrient Sources in Soilless Culture Experiments," "Preliminary Studies on the Mechanism of 2,4-Dichlorophenoxyacetic Acid in Higher Plants," "The Healing Action of Extracts of *Aloe vera* Leaf on Abrasions of the Human Skin," "Spectral Properties of Protochlorophyll Isolated by Absorption," "Phytotoxic Reactions of Blood Sera as an Aid to Medical Diagnosis and Therapy," "Photoperiodic Responses in Corn," and "Some Common Alcohols as Carbon Sources for Plant Tissue Cultures." Special symposia include a Sunday afternoon session on "Radioactive Isotopes in Plant Physiological Research," and a Monday afternoon session on "Dormancy." The Plant Physiologists' Dinner will be held on Saturday evening in the Casino Room of the Congress Hotel. Following the Charles Reid Barnes Life Membership Award, Burton E. Livingston will present the Stephen Hales Lecture, and B. M. Duggar will speak on "Physiology and Prevailing Influences."

The American Society of Plant Taxonomists will meet jointly with the Systematic Section of the Botanical Society of America from Saturday through Tuesday, December 27–30. The Plant Taxonomists' Dinner will be held in the South Ballroom of the Stevens Hotel on Monday evening, December 29.

The Botanical Society of America will hold its 42nd annual meeting Saturday through Tuesday, December 27–30, at the Stevens Hotel. In addition to a business meeting and meeting of the General Section on Saturday morning, three sessions will be held by other sections. The Microbiological Section will hold a symposium on "Nutrition and Metabolism of Microorganisms," the Physiological Section will meet jointly with the American Society of Plant Physiologists, and the Systematic Section with the American Society of Plant Taxonomists. On Saturday afternoon all the plant science societies will meet with the AAAS Section on Botany, W. G. Loehwing presiding. The Botanical Teaching Section will meet Sunday morning and afternoon, the latter session being a symposium on "General Botany Texts." Tickets to the Botanists' Dinner, to be held Sunday evening on the 8th floor of the Stevens Building Restaurant, 17 North State Street, may be purchased at the Ticket Booth in the AAAS Registration Area, Stevens Hotel. On Monday morning concurrent sessions will be held by the General Section, Microbiology Section (jointly with other biological societies for a symposium on the "Genetics of Microorganisms"), Physiological Section, Paleobotanical Section, and Systematic Section (jointly with the American Society of Plant Taxonomists for a symposium on "Biological Nomenclature"). With the exception of the Paleobotanists, these same sections will meet in the afternoon: Microbiological Section jointly with the

Mycological Society of America; Physiological Section jointly with the American Society of Plant Physiologists and the American Society for Horticultural Science (symposium on "Dormancy"); Systematic Section jointly with the American Society of Plant Taxonomists. The Microbiological, Physiological, and General Sections will reconvene Tuesday morning and afternoon. The Paleobotanical Section will meet jointly in the morning and afternoon with the Society for the Study of Evolution for the presentation of symposia on "The Evolution and Classification of Angiosperms and Gymnosperms." The final meeting of the Systematic Section will be held Tuesday morning.

The Mycological Society of America will meet Saturday through Tuesday, December 27–30, at the Stevens Hotel. With the the exception of sessions of contributed papers on Saturday morning and Tuesday morning, all meetings of the mycologists will be joint with the Microbiological Section of the Botanical Society of America.

The Phycological Society of the Americas, in addition to a business meeting on Sunday morning, will hold a meeting of general papers in the Stevens Hotel on Wednesday morning, December 31. Among the papers are: "Marine Algae of the Marshall Islands," "The Case Against a Separate Division or Phylum for the Characeae," and "A Review of Phycological Investigations in Southeastern United States."

The Sullivant Moss Society plans a breakfast in the Standard Restaurant, Standard Oil Building, 910 S. Michigan Avenue, Monday morning, December 29. At 9:00 A.M. the group will convene in the Stevens Hotel for a business session followed by a program of short papers. The afternoon session will be devoted to a symposium on "Generic Concepts of the Bryophyta."

Section H (*Anthropology*) will meet on Friday and Saturday, December 26–27, at the Sherman Hotel. Papers on General Anthropology will be presented Friday afternoon. In the evening Wilson D. Wallis will present a dinner address as vice-president of the AAAS and chairman of the Section on Anthropology. His address, "Presuppositions in Anthropological Interpretations," will be followed by a motion picture. On Saturday the morning session will be on "Linguistics and Culture" and the afternoon program a joint session with the Society for Research in Child Development on "The Socialization of the Child." Representative papers include "Some California Traits and Their Eastern Parallels," "Are Basic Needs Ultimate?," "Linguistic Descriptions as Axiomatic Systems," and "Sociological Aspects of Some Features of English Pronunciation."

Section I (*Psychology*) will join with the Sections on Zoological Sciences, Social and Economic Sciences, History and Philosophy of Science, and the American Philosophical Association in the presentation of a symposium on "Problems of Concept Formation in Psychology," Saturday afternoon, December 27. The Monday morning session will be on "Physiological Psychology," and the afternoon session on "Learning." "Personnel and Educational Psychology" will be the subject of the Tuesday morning session. Selected papers include "On the Control of Blood Pressure in Man," "The Effects of Different Types of Preliminary Activities on Subsequent Learning of Paired-Associate Material," "Criteria of Learning in Educational Research" (address of AAAS vice-president and chairman of the Section on Education, W. A. Brownell), "The Work of Our Hands" (address of AAAS vice-president and chairman of the Section on Psychology, Edna Heidbreder), "The New Army Rating System—Its Development and Validation," and "American Intelligence."

The Society for Research in Child Development will meet on Saturday, December 27, at the Palmer House. The morning session is on "Projective Techniques in the Study of Children" and "Biological Factors in Personality Formation." "Socialization of the Child" will be discussed in the afternoon. Titles selected at random include "Children's Personality and Their Painting," "Doll Play," "Biology and Personality in Young Children," "Socialization and the Parent-Child Relationships," and "The Fate of Basic Drives in Various Cultures."

Section K (*Social and Economic Sciences*) will meet Saturday through Wednesday, December 27–31, at the Sherman Hotel. The opening session on Saturday morning will be a symposium on "War and Postwar Population and Labor Force Developments." In the afternoon there will be a joint symposium with the Section on the History and Philosophy of Science on "Are Human Social Problems in a Different Category from the Integrations of Biology?" Section K will join with the American Economic Association for a dinner session on Sunday evening. A joint symposium with the National Association of Science Writers on "The Problem of Making Scientific Findings Comprehensible to the Public" will be held on Monday afternoon. On Tuesday afternoon "Production Functions and the Theory of the Firm" will be discussed jointly with the Econometric Society in Room 507, Wieboldt Hall, on the Chicago Campus of Northwestern University. The closing session on Wednesday morning will be a symposium on "Some Determinants of National Productivity," held jointly with the American Economic Association, Academy of World Economics, and the AAAS Section on Engineering. Among the papers are "Labor Force Developments," "The Responsibility of the Science Writer," "Factors Affecting International Differences in Production," and "Relation of Energy Output to Production in the United States."

The Academy of World Economics will participate in a joint symposium with other social science societies on "Some Determinants of National Productivity," Wednesday morning, December 31.

The Econometric Society will meet Saturday, Monday, and Tuesday, December 27, 29, and 30. In addition to contributed papers, the Society has organized several symposia: "Relationships Derived From Aggregate Data," Saturday afternoon; "Savings Investment and Wage Rates," Monday afternoon; "Inventories in the Business Cycle," Tuesday morning; and "Production Functions and the Theory of the Firm," Tuesday afternoon.

Pi Gamma Mu, National Social Science Honor Society will hold a luncheon in honor of the officers and speakers appearing on the program of the AAAS Section on Social and Economic Sciences, Saturday noon, in Rooms 109 and 110, Sherman Hotel.

Section L (History and Philosophy of Science) will meet Saturday and Sunday, December 27 and 28, at the Sherman Hotel. Each session will be a symposium held jointly with the American Philosophical Association. On Saturday the morning session will be on "Foundations of Modern Physics," followed in the afternoon by a session on "Problems of Concept Formation in Psychology," held jointly with the AAAS Sections on Zoological Sciences, Psychology, and Social and Economic Sciences. The concluding session on Sunday afternoon, to be held jointly with the AAAS Section on Social and Economic Sciences, will be on "Are Human Social Problems in a Different Category From Integrations of Biology?" Representative papers include "The Formation of Concept in Personality and Dynamic Psychology," "The Problem of Anxiety: Some Conceptual Difficulties," "The Place of Logic in the Advance of Science," "Cosmology and Logic," "Principles of Impotence in Modern Physics," "Biological Principles in Sociology," "Human Social Problems as a Type of Disintegration in a Biological Integration," and "The Relation Between Biological Cultural Factors in Social Problems" (Section L vice-presidential address by F. S. C. Northrop).

The American Philosophical Association will hold all of its sessions jointly with the AAAS Section on the History and Philosophy of Science.

The Philosophy of Science Association will meet on Saturday and Sunday, December 27 and 28, at the Palmer House, for the presentation of a syposium on "What Does the Natural Scientist Need From the Social Scientist?"

Section M (Engineering) will meet Tuesday and Wednesday, December 30–31, at the Stevens Hotel. The sessions on Tuesday will be devoted to a symposium on "Limnological Aspects of Water Supply and Waste Disposal," held jointly with the Limnological Society of America. On Wednesday morning there will be a joint symposium on "Some Determinants of National Productivity" with the American Economic Association, Academy of World Economics, and the Section on Social and Economic Sciences. Representative papers include "Some Epidemiological and Biological Problems in Water-Borne Amoebiasis," "Biotic Responses to Stream Pollution During Artificial Stream Reaeration," "Plankton as Related to Nuisance Conditions in Surface Water," "Prevention of Algal Nuisance by the Removal of Nitrogen and Phosphorous From Sewage Plant Effluents," and "The Algologist's Part in the Solution of City and Industrial Water Supply Problems."

Section N, Medical Sciences (Subsection on Medicine) will meet Monday through Tuesday afternoon, December 29–30, at the Sherman Hotel, for the presentation of a symposium on Antibiotics. The subdivisions of the symposium are "Production, Chemistry, and Lesser Known Substances," Monday morning; "Pharmacology and Action of Antibiotics," Monday afternoon; "Development of Resistance to Antibiotics," Tuesday morning; and "Clinical Applications," Tuesday afternoon. On Tuesday afternoon E. V. Cowdry, as vice-president of the AAAS and chairman of the Section on Medical Sciences, will deliver an address entitled "Symbiosis and Antibiosis."

Section N, Medical Sciences (Subsection on Dentistry) will hold a symposium on "Dental Caries" on Sunday, December 28, at the Sherman Hotel. The morning program will be on "Bacteriological and Biochemical Aspects," the afternoon program on "Nutrition and Substrata," and, following the Dentists' Dinner, papers will be presented on "Prevention and Control, Public Health Aspects." Representative papers will include "Is Caries of Enamel a Process of Decalcification Resulting From Bacterial Action?," "Nutritionist's View of the Caries Problem," "What Is the Relative Importance of the Polysaccharides, Disaccharides, and Monosaccharides in Caries Production?," and "Roles of Dental Clinics in Caries Control."

Section N, Medical Sciences (Subsection on Pharmacy) will hold an all-day session of general papers on Saturday, December 27, at the Sherman Hotel. Representative papers include "Methods for the Evaluation of Compounds With Curare-like Action," "Antagonism of Histamine and Epinephrine With Synthetic Chemicals," and "Industrial Pharmacy: Opportunities and Training."

The American Dietetic Association will meet on Monday and Tuesday, December 29–30, at the Palmer House. General papers include "The Nitrogen Metabolism of Women," "Food and Its Emotional Significance," and "Problems of Feeding the School Age Child."

Section O (Agriculture) will hold a joint symposium on "Breeding and Improvement of Horticultural Crops" with the American Society for Horticultural Science on Tuesday afternoon, December 30. W. A. Alderman, vice-president of the AAAS and chairman of the Section on Agriculture, will speak on "Fruit Breeding: Past, Present, and Future." Other papers include "Genetics as a Tool of the Plant Breeder" and "Breeding of Ornamental Plants."

The American Society for Horticultural Science will hold its 44th annual meeting Monday through Wednesday, December 29–31. Concurrent sessions on Monday include "Pomology—Nutrition," "Pomology—Breeding and Propagation," "Vegetables—Tomatoes," and "Floriculture and Ornamental Horticulture—Herbicides, Growth Regulators, and Nutrition." A joint symposium on Dormancy will be held on Monday afternoon with the American Society of Plant Physiologists and the Physiological Section of the Botanical Society of America. Monday evening round-table sessions include "Breeding Methods for Horticultural Crops," "Mineral and Nitrogen Deficiency Diagnosis," "Discussion on Education," and "Discussion on Extension in Horticulture." Four concurrent sessions have been planned for Tuesday morning: "Pomology—Growth Regulators and Chemical Flower Thinners," "Pomology—Small Fruits and Grapes," "Vegetables—Herbicides and Growth Regulators," and "Floriculture and Ornamental Horticulture —General." The Tuesday afternoon sessions include a joint symposium with the AAAS Section on Agriculture on the "Breeding and Improvement of Horticulture Crops." Running concurrently will be sessions on "Fruit Physiology and Storage" and "Vegetables—General." At the annual banquet, on Tuesday evening in the Red Lacquer Room of the Palmer House, H. B. Tukey will present the presidential address of the Society on "Horticulture in Science and Society." The concluding sessions on Wednesday morning will cover "Pomology—General," "Vegetables—Breeding and Nutrition," "Vegetables—Potatoes and Sweet Potatoes," and "Floriculture and Ornamental Horticulture." A business meeting of the Society will be held on Wednesday afternoon for reports of committees and election of officers.

The Potato Association of America will hold its 21st annual meeting Sunday through Wednesday, December 28–31, at the Palmer House. The opening session on Sunday afternoon will be a round-table discussion on "Seed Certification." On Monday a session on general papers has been planned for the morning and a "Smoker and General Round-Table Discussion" scheduled for the evening in Private Dining Room 18 of the Palmer House. On Tuesday morning the society will meet jointly with the American Phytopathological Society at the Stevens Hotel, followed by an afternoon session of general papers in the Palmer House. The concluding session on Wednesday morning will be joint with the American Society for Horticultural Science. Representative papers include "Progress of Virus and Bacterial Disease Investigations," "Insect Investigations in 1947," "Chemical Control of Weeds in Potatoes," and "Effects of Spraying a Sprout Inhibitor on Potato Plants in the Field."

Section Q (*Education*) will meet Monday and Tuesday, December 29–30, at the Sherman Hotel. A symposium on Science and Social Philosophy will be held on Monday morning, and in the evening the chairmen of the AAAS Sections on Psychology and Education will present addresses before a joint session with the Section on Psychology. W. A. Brownell will speak on "Criteria of Learning in Educational Research," and Edna Heidbreder's address will be on "The Work of Our Hands." On Tuesday morning Guy T. Buswell will preside at a symposium on "Group and Individual Research," followed by an afternoon session of general papers. The business meeting of the Section will be held immediately following the last paper of this session. Representative papers on the program of the Section on Education include "The Scientific Point of View in Education," "The Social Responsibilities of Modern Science," "Education and the Scientific Outlook in Philosophy," "The Role of Individual Research in a World of Large-Scale Organization," and "International Comparisons in Child Development in Spelling."

AAAS Cooperative Committee on Science Teaching will meet Saturday through Tuesday, December 27–30, at the Sherman Hotel. The opening session will be a business meeting on Saturday evening. Sunday evening the Committee will hold a dinner session followed by a forum on "The Effectiveness of Science Teaching." The remaining sessions on Monday and Tuesday will be held jointly with the National Science Teachers Association. For additional information, consult the AAAS Special Sessions listed in the forepart of this Preview.

The National Science Teachers Association will meet Friday through Tuesday, December 26–30, at the Sherman Hotel. The Junior Scientists' Assembly, a program of papers, talks, and discussions by members and recent members of Junior Academies of Science, Science Clubs of America, and School Science Clubs, will be held on Saturday afternoon. On Sunday afternoon there will be a session on "The Relations of Science Teaching With Industry." Three concurrent sessions, joint with the AAAS Cooperative Committee on Science Teaching, have been scheduled for Monday morning. The program of the annual luncheon of the National Science Teachers Association, to be held on Monday at noon, will include a tribute to the life and work of Otis W. Caldwell. Tickets to the luncheon may be obtained at the registration desk in the Sherman Hotel. Meetings of the Board of Directors will be held on Monday and Tuesday evenings. Rooms 103 and 104 will serve as the convention headquarters for the National Science Teachers Association throughout the meeting period.

Pi Lambda Theta has arranged a Tour of Modern Art and a Tea, for all scientists, at the Art Institute of Chicago on Sunday afternoon, December 28. The Tour of the Birch Bartlett Gallery of Modern Art will commence at 2:30 P.M. Tea will be served from 3:30 to 5:00 P.M. A nominal admission fee of $1.00 will be charged. Tickets may be obtained at the ticket booth in the registration area in the Stevens Hotel.

The American Nature Study Society will meet Friday

through Tuesday, December 27–30, at the Sherman Hotel. In addition to sessions of general papers, the Society will hold a panel discussion on "What Is Resource-Use Education and How Does It Fit Into Our School Program?" on Monday afternoon, and a symposium on "Teaching Behavior in High School Biology" on Tuesday morning and afternoon, jointly with the National Association of Biology Teachers. On Sunday morning a joint Field Trip has been planned with the NABT to Dune State Park, with E. W. Teale and E. L. Palmer as leaders. The annual banquet will be held on Saturday evening in the Crystal Room of the Sherman Hotel. E. W. Teale will speak on "Adventures in an Insect Garden."

The National Association of Science Writers, in addition to a business meeting held immediately following the AAAS-George Westinghouse Science Writing Awards Ceremony on Saturday evening, will hold a joint symposium on Monday afternoon entitled "The Problem of Making Scientific Findings Comprehensible to the Public," with the AAAS Section on Social and Economic Sciences.

Honor Society of Phi Kappa Phi will hold a business session on Monday afternoon, December 29, and a breakfast session on Tuesday morning. There will be a second business session immediately following the breakfast.

The Research Council on Problems of Alcohol will m for a morning and afternoon session on Monday, cember 29, at the Sherman Hotel. Representative pa include "Unexplored Frontiers in Scientific Research the Problem Drinker," "The Medical Approach to Pr lem Drinking," "Fundamental Research Plan to Probl Drinking," and "Medicolegal Problems and the Probl Drinker."

Sigma Delta Epsilon Graduate Women's Scient Fraternity will meet Saturday through Monday, D cember 27–29, at the Sherman Hotel. The Natio Council Meeting will be held on Saturday morning; luncheon for all Women in Science, at which Marjo Carlson will speak on "Plant Collecting in Salvado will be held on Saturday afternoon; and the Nation Convention Breakfast will be held on Monday morni

Society of the Sigma Xi will meet on Monday a Tuesday, December 29–30. A meeting of the Executi Committee will be held at 9:00 A.M. on Monday in t secretary's suite, Sherman Hotel. The Annual Conve tion of the Sigma Xi will be held in the Crystal Room the Sherman Hotel on Monday evening, December 2 and the Annual AAAS-Sigma Xi Lecture will be delivere in the Grand Ballroom of the Sherman Hotel on Tuesda evening, December 30. Glenn T. Seaborg will speak o "The Eight New Synthetic Elements."

About the Press Room—

As stated on page 556 of this issue, press headquarters for the Chicago meeting will be in Parlors L, M, and O of the Sherman Hotel, with Sidney S. Negus, professor of chemistry, Medical College of Virginia, and president-elect of the Virginia Academy of Science, in charge. Dr. Negus is also a member of the National Association of Science Writers.

The preparation of facilities in the press room for the use of news reporters is under the direction of Miss Jeannette Lowrey, Office of Public Relations, University of Chicago, and chairman of the local AAAS Publicity Committee. During the meeting Dr. Negus and members of the press room staff will distribute news releases, arrange press interviews, and otherwise manage the press relations of the Association.

Speakers, who have been unable to file abstracts or manuscripts of their papers with the Press Director in advance of the meeting are requested to turn them in at the press room in Chicago at least 12 hours in advance of their presentation.

It is a general rule among science writers that, in order for a paper to qualify as news, there must be some point of contact between the subject and the public. Science writers sometimes uncover newsworthy material in the most prosaically written reports. It is much more likely that an abstract will attract the science writer and appear in print if the opening paragraph draws attention to the social aspects of the investigation or emphasizes the possible utilitarian value of the results to the public. Wholehearted cooperation is required of both scientists and science writers if the Association is to realize one of its principal goals—"to increase public understanding and appreciation of the importance and promise of the methods of science in human welfare."

Science Exhibition

The AAAS International Science Exhibition, held annually in conjunction with the meetings of the Association, will be housed this year in the Exhibition Hall of the Stevens Hotel, Michigan Boulevard and Eighth Street. The Stevens Hotel is conveniently located and can be reached easily from all points in Chicago.

The exhibition will be open on Friday, December 26, from 1:00 to 9:00 P.M.; on December 27, 28, and 29, from 9:00 A.M. to 5:00 P.M.; on December 30, from 1:00 to 9:00 P.M.; and on December 31, from 9:00 A.M. to 12:00 noon.

The exhibition always brings together displays of products and services of substantial interest to scientists. Members will find it convenient to proceed directly to the exhibition after having completed their registration in the foyer just outside of the Exhibition Hall. Admission is restricted to members and registered guests. College students may be given special passes upon application to the director of the exhibit. High school students are not admitted.

Directory of Exhibits

The standards for exhibiting at the AAAS meetings have always been high, and this year's exhibitors have qualified in every way for participation. The Association expresses appreciation on behalf of its members for the cooperation of the exhibitors in organizing an excellent series of technical and scientific exhibits.

Special Exhibits

The AAAS International Science Exhibition this year presents three special exhibits, all of which are grouped around the theme, "Photography in Science." Scientists will find these of unusual interest with regard to both the results shown and the techniques developed and displayed through the medium of finished photographs.

The First International Salon, "Photography in Science." Early in 1947 the Smithsonian Institution, Division of Graphic Arts, and the Association's publication, *The Scientific Monthly*, announced plans for a jointly sponsored photographic competition which would be restricted to scientists. The purpose of the competition was to extend the possibilities of research through functional photography. The officers of both sponsoring organizations felt that the results achieved in the first year of the competition justified the announcement of a second competition in 1948.

The First Annual Competition resulted in the submission of nearly 400 prints, two-thirds of which were in black and white and one-third in color. A great majority of these prints will be on display in the Exhibition Hall during the full time of the meeting. Information about the Second Annual Competition will be available at that time.

The Association acknowledges the assistance of the staff of the Armour Research Foundation for arranging the hanging of this exhibit.

Atomic Energy. The editors of *Life*, the national pictorial weekly, have gathered together a significant series of photographs, many of which have not been published previously, under the title of "Atomic Energy." This unique series of photographs will have its premier showing at the meetings in Chicago. The Association is indebted to the editors of *Life* not only for the large amount of time and effort which went into producing this special showing but also for their willingness to undertake it for the benefit of the members.

Biological Photography. For many years the Biological Photographic Association has been the leading association in the development of photography as a tool for biological research. At the Oklahoma City annual meeting of the BPA a number of outstanding prints were gathered together for awards and further showing through other scientific associations. The Biological Photographic Association graciously consented to send a group of 70 prints to the Chicago meetings prior to circulating them in other parts of the country. The Association expresses its appreciation for this courtesy which will enable members in all fields of science to see these excellent pictures.

The members of the exhibition staff feel that these three photography exhibits should be seen by every member in attendance at the meetings. The staff will gladly arrange to have complete technical details about any print or group of prints furnished to any member desiring this information.

American Association for the Advancement of Science. The Association, as the largest general scientific society in the country, participates in many ways in the activities of other societies. In addition, it publishes *Science* and *The Scientific Monthly* regularly. At intervals it publishes the *Association Proceedings*, which usually covers a period of four years of the Association's activities plus a directory of the membership at the time of each publication. During recent years the Association has also pub-

lished more than 20 technical symposia in a variety of fields. These symposia have received wide acclaim not only for the contribution made to the research literature but for the excellence of editorial format and direction.

The Association's booth will show copies of the technical symposia which are still in print and a group of *Proceedings* from the first 100 years of the Association's operation. Members of the publications staff from the Washington office will be in attendance at all times. It is hoped that scientists who wish to publish articles in either of the journals will take advantage of this opportunity to meet the editorial personnel. Members of the Circulation Department will be on hand to receive subscriptions for the publications.

The Centennial celebration of the Association will be held in Washington, September 13–17, 1948. The Greater National Capital Committee of the Washington Board of Trade has arranged an interesting exhibit about the city of Washington and the District of Columbia. Members planning to attend the Centennial celebration in Washington will find this a convenient time to make inquiry about hotel accommodations and points of interest which they may want to visit during their stay in Washington.

Science Theater

This year for the first time the Association is sponsoring a Science Theater, the purpose of which is to emphasize the use of motion pictures in recording scientific research. Films have been submitted by academic, governmental, and industrial research organizations from all over the country, and promise to be of high quality. The films cover such a variety of subjects that the Science Theater is certain to be of interest to every member attending the meetings.

The hours during which the theater will be open are as follows: December 26, 2:00 to 5:00 P.M. and 7:00 to 9:00 P.M.; December 27, 28, and 29, 9:00 A.M. to 12:00 noon and 2:00 to 5:00 P.M.; December 30, 2:00 to 5:00 P.M. and 7:00 to 9:00 P.M.; December 31, 9:00 A.M. to 12:00 noon.

Final information concerning the schedule of films to be shown will be available at the Association booth in the Exhibition Hall. The tentative schedule follows:

Friday, December 26

2:00–5:00 P.M.

High-Speed Motion Pictures. Prof. Charles E. Locke, Massachusetts Institute of Technology. 11 minutes.

3,000 Pounds Per Square Inch. Taylor-Wharton Iron & Steel Company. 30 minutes.

Ceiling Unlimited. Aviation Department, Socony-Vacuum Oil Company. 28 minutes.

Seeing the Unseen. Prof. Charles E. Locke, Massachusetts Institute of Technology. 11 minutes.

Body Care and Grooming. McGraw-Hill Book Company. 17 minutes.

The Nose, Throat, and Ears. McGraw-Hill Book Compa 10 minutes.

The Body Fights Disease. McGraw-Hill Book Company. minutes.

The Story of Reproduction. McGraw-Hill Book Company. minutes.

Emotional Health. McGraw-Hill Book Company. 21 minute

Note: The McGraw-Hill Book Company has recently r leased the above 5 films. The films represent a substanti investment on the part of the Company to explore and exte the use of film as a teaching aid when used in conjunction wi text material.

7:00–9:00 P.M.

Malaria in Monkeys. Dr. Melvin H. Knisely, Department Anatomy, University of Chicago. 2 hours.

Saturday, December 27

9:00 A.M.–12:00 noon

Dental Silicate Cement. National Bureau of Standards. 1 minutes.

Title to be announced. University of Maryland Dental Schoo

Malaria in Monkeys. Dr. Melvin H. Knisely, Department Anatomy, University of Chicago. 2 hours.

2:00–5:00 P.M.

Energy Release From Food. The Upjohn Company. 26 minute

Effect of Drugs on the Heart in Situ. Dr. R. P. Walton, Medic College of the State of South Carolina. 32 minutes.

The Medical Motion Picture—Its Development and Prese Application. American Medical Association. 32 minute

Keratoplasty—Circular Transplant Technic. Dr. Ramo Castroviejo, The Institute of Ophthalmology, Columbi Presbyterian Medical Center. 15 minutes.

Keratoplasty—Square Transplant Technic. Dr. Ramo Castroviejo, The Institute of Ophthalmology, Columbi Presbyterian Medical Center. 18 minutes.

Precancer Diagnosis of Cervix by Cytology. Gyne-cytolog Laboratory, Royal Victoria Hospital, Montreal, Canada 19 minutes.

Sunday, December 28

9:00 A.M.–12:00 noon

Continuous Spinal Analgesia in Caesarean Section. Dr. John C Ullery, Philadelphia. 15 minutes.

Open Drop Ether. British Information Services. 31 minutes.

Nitrous Oxide-Oxygen-Ether Anaesthesia. British Information Services. 27 minutes.

The Carbon-Dioxide Absorption Technique. British Information Services. 24 minutes.

Signs and Stages of Anaesthesia. British Information Services. 23 minutes.

Endotracheal Anaesthesia. British Information Services. 26 minutes.

2:00–5:00 P.M.

Operative Shock. British Information Services. 16 minutes.

Respiratory and Cardiac Arrest. British Information Services. 15 minutes.

Handling and Care of the Patient. British Information Services. 26 minutes.

Spinal Anaesthesia. British Information Services. 34 minutes.

Intravenous Anaesthesia, Part I. British Information Services. 30 minutes.

Intravenous Anaesthesia, Part II. British Information Services. 25 minutes.

Note: All of the films shown in this symposium on anesthesia were made available to the exhibition through the courtesy of the British Information Services. The exhibition staff is particularly pleased to present them at this time not only as evidence of the international exchange of scientific information but also for the purpose of showing what scientists in other countries are doing.

Monday, December 29

9:00 A.M.–12:00 noon

Magnesium—Metal From the Sea. Bureau of Mines. 23 minutes.

Synthetic Rubber. Bureau of Mines. 21 minutes.

Body Care and Grooming. McGraw-Hill Book Company. 17 minutes.

The Nose, Throat, and Ears. McGraw-Hill Book Company. 10 minutes.

The Body Fights Disease. McGraw-Hill Book Company. 15 minutes.

The Story of Reproduction. McGraw-Hill Book Company. 23 minutes.

Emotional Health. McGraw-Hill Book Company. 21 minutes.

2:00–5:00 P.M.

Light Control Through Polarization. Polaroid Corporation. 20 minutes.

High-Speed Fastax Camera. Bell Telephone Laboratories. 15 minutes.

Drama of Steel. Bureau of Mines. 34 minutes.

Lubrication. Bureau of Mines. 30 minutes.

Magnetic Recording. Armour Research Foundation.

Counter Gravity Casting. Armour Research Foundation.

Radio Frequency Heating. RCA Laboratories.

Image Orthicon. RCA Laboratories.

Tuesday, December 30

2:00–5:00 P.M.

Arizona—Its Mineral Resources and Scenic Wonders. Bureau of Mines. 40 minutes.

Evolution of the Oil Industry. Bureau of Mines. 34 minutes.

Dental Silicate Cement. National Bureau of Standards. 18 minutes.

Title to be announced. University of Maryland Dental School.

Use of the Calf for Surgical Training and Research. Dr. Ivan E. Martin, Los Angeles.

Explosions on the Sun. Harvard College Observatory and University of Colorado. 12 minutes.

7:00–9:00 P.M.

Photography as an Aid to Mine Development. Naval Ordnance Laboratory.

Magnetic Recording. Armour Research Foundation.

Counter Gravity Casting. Armour Research Foundation.

High-Speed Fastax Camera. Bell Telephone Laboratories. 15 minutes.

Drama of Steel. Bureau of Mines. 34 minutes.

Wednesday, December 31

9:00 A.M.–12:00 noon

Repeat showing of selected films by special request.

Science Library

Continuing a practice developed by the AAAS International Science Exhibition many years ago there will be a cooperative display of new books and established text and reference works submitted by the leading publishers in the United States. This year the Science Library will be managed by the Illinois Chapter of the Special Libraries Association. This group of librarians will arrange the displays and have the library staffed with librarians well versed in the publications and literature of all major fields of science.

A special feature of the library this year will be a display of a group of standard reference books selected by a committee of librarians.

The following publishers have indicated that selected books published by them will be available for inspection during the meetings: Academic Press, Inc.; Annual Reviews, Inc.; The Blakiston Company; Boni & Gaer, Inc.; Chemical Publishing Co.; Chronica Botanica Co.; Columbia University Press; Comstock Publishing Company; Cornell University Press; Crown Publishers; D. Appleton-Century Company, Inc.; Dodd, Mead & Company, Inc.; Garlan Publications; Harper & Brothers; Harvard University Press; D. C. Heath and Company; Henry Holt & Co.; Houghton Mifflin Company; Interscience Publishers, Inc.; Iowa State College Press; Journal of Chemical Education; Lea & Febiger; Longmans, Green & Co., Inc.; McGraw-Hill Book Company, Inc.; The Macmillan Company; The C. V. Mosby Company; Philosophical Library; Pitman Publishing Corporation; Princeton University Press; Reinhold Publishing Corporation; W. B. Saunders Company; Peter Smith; Stanford University Press; University of Chicago Press; University of Wisconsin Press; D. Van Nostrand Company; The Viking Press, Inc.; John Wiley & Sons, Inc.; and Yale University Press.

In many instances the books shown in the Science Library are only a portion of the total list of titles published by each firm. Complete catalogues may be secured by leaving such a request with the librarian in charge. Many of the firms depositing books in the Science Library also have more complete displays in their own booths. Visitors to the Science Library are urged to visit these other booths to examine current publications.

Allyn and Bacon

Boston, Massachusetts

Booth No. 5

Allyn and Bacon beg leave to call special attention to their complete 12-year science series to be on exhibit. This series includes the *Rainbow readers* and *Workbooks* for the first 6 grades, followed by Carpenter and Wood's *Our environment series* for the junior high school years, and Smallwood's *Biology*, Fuller, Brownlee, and Baker's *Physics*, and Brownlee and others' *Chemistry*. Several of these books are national leaders. All are provided with workbooks and teachers' manuals.

American Optical Company

Buffalo, New York

Booth No. 1

The American Optical Company, Scientific Instrument Division, manufacturers of Spencer instruments, will have on display the following: new accessories for Spencer Phase Microscope, which utilizes optical path differences of unstained, transparent material to show sharp outline and internal detail at full resolution; a new Spencer Stereoscopic Shop Microscope; a new 2" x 2" slide projector with coated optics and self-centering slide carrier; also, new self-centering slide carriers for current Spencer Delineascopes. In addition, a selection of well-known Spencer instruments will be shown and demonstrated. Messrs. J. J. Host, G. W. Frid, G. E. Guellich, R. W. Schmader, and a full staff will be in attendance to discuss any optical questions presented.

Armour and Company

Chicago, Illinois

Booth No. 51

High molecular weight aliphatic compounds and crystallized proteins of recent development will be displayed by the Chemical Research and Development Department of Armour and Company. Among the high molecular weight aliphatic compounds will be ketones, amidoesters, quarternary ammonium chlorides, tertiary amines, tertiary amine oxides, and a dimeric nitrile. The crystallized proteins will feature bovine plasma albumin and several crystallized enzymes, pepsin, trypsin, chymotrypsin, lysozyme, and ribonuclease. Technical information and possible applications will be available on these and related materials, such as fibrinogen, adenosine triphosphate, bilirubin, and Armour Catalase, technical grade.

Bausch & Lomb Optical Company

Rochester, New York

Booth Nos. 79, 80, and 81

The Bausch & Lomb Optical Company booth will be given over primarily to the exhibition and demonstration of four of the latest developments in the field of microscopy. The new series of Bausch & Lomb microscopes with Variable Focus Condenser provides, for the first time, quick, accurate focusing of microscope substage illumination. With the new condenser, the area of the illuminated field is increased and the numerical aperture of the beam decreased by merely racking the condenser down. In a companion demonstration, the new Bausch & Lomb Phase Contrast Microscope Accessories will be shown. You are invited to bring in your own unstained preparations for your personal examination with phase contrast. Comp tive photomicrographs of a wide selection of living mat will also be available for study. The B & L Fluorescence Mi scope Accessories for tubercle bacilli detection will also shown. This method is applicable to both smears and tis stained with auramine. Balcoted Microscope parts will be played for your examination.

Biological Abstracts

Philadelphia, Pennsylvania

Booth No. 7

A cooperative, nonprofit journal published by biologists biologists, *Biological Abstracts* is the only abstracting and dexing service in the world that affords an adequate cover of the literature in all fields of biology. Currently abstract some 2,700 journals, the coverage is being expanded as rapi as possible to include the many European, Scandinavian, a Asiatic journals that have not been available to the scienti of this country since the outbreak of the war. *Biological A stracts* is published both in a complete edition and in 9 lo priced sectional editions especially designed for individ biologists who are interested only in one or more closely rela fields. These sectional editions will be on display, and Dr. Jo E. Flynn, editor-in-chief, and H. I. Anderson, business ma ger, will be in attendance to welcome visitors and furni information.

The Blakiston Company

Philadelphia, Pennsylvania

Booth No. 50

The Blakiston Company, Philadelphia and Toronto, w display a wide selection of science textbooks representing bo the undergraduate and research fields. Among the textboo visitors should examine are: Emerson, *Basic botany*; Ho *Secondary-school science teaching*; Lille, *Histopathologic techn* Foley-Glathart, *College physics* (4th ed.); Mettler, *History medicine*; Dethier, *Insect attractants & repellents*; Edward *Concise anatomy*; Chester, *Nature & prevention of plant diseas* (2nd ed.). Attendants will be glad to discuss new manuscrip and additional forthcoming books.

Wm. C. Brown Company

Dubuque, Iowa

Booth No. 139

This company will have on display all of its latest public tions, including laboratory manuals, workbooks, and outlin in the fields of biology, zoology, botany, home economic physics, chemistry, engineering, and medicine. Complete seri of the popular Pictured-Key Nature books will also be avai able for inspection. Booklets will be available at the booth this company giving complete information concerning i specialized publishing service.

Burgess Publishing Company

Minneapolis, Minnesota

Booth No. 105

This will be an educational book display by one of the fe established photo-offset and mimeoprint book publishers i the country. Specialists in the publishing of small-run editio

college and university courses, Burgess offers the instruc-, the department head, or the organizational scientist an portunity to publish his own text or manual in quantities small as 100. Burgess books are reproduced by superior lity photo-offset and mimeoprint processes. The type is n, distinct, and easy to read. Illustrations reproduce rply and clearly. Full details will be available at the booth, many Burgess volumes, now adopted by hundreds of leges and universities throughout the country, will be on play.

Central Scientific Company

Chicago, Illinois

Booth Nos. 27 and 28

Cenco invites all of those in attendance to visit booths 27 d 28. Here will be shown new apparatus for laboratory work- in physics, chemistry, and biology. The display will include e A.C.-operated Cenco Titration-pH Meter, the Cenco 5" cilloscope in connection with the Cenco Electronic Switch d Multiple Input Audio Frequency Amplifier and Perma- nt Magnet Speaker, new Cenco Dial Resistance Boxes and ecade Condensers, the Cenco "Photelometer," Concentrated- c Lamps, the Polaroid Polariscope, new Bakelite Boxes at hold 100 microscope slides, Cenco High Vacuum Pumps, d other items. Selective Experiments in Physics which per- it the instructor to make a selection of experiments most itable for his course will also be featured. Members of the nco staff will be in attendance to greet friends and to discuss paratus.

Chicago Apparatus Company

Chicago, Illinois

Booth No. 69

The Chicago Apparatus Company, manufacturers and dis- ibutors of scientific laboratory supplies for educational and search institutions, will exhibit for the Physics Department new stroboscope, a new electric atom model, and a practical aching model of the oscillograph; for the chemists, research odels of analytical balances, Beckman pH Meters, precision aters, and the new metal heating mantles of the Glas-Col Company; and for the Biology Department, the chick embryo odel as well as the latest model microscopes. You are cor- ially invited to discuss your problems with either of the three epresentatives, Messrs. F. D. McCally, John Geisel, and ee Tennis.

Thomas Y. Crowell Company

New York, New York

Booth No. 133

The Crowell booth will display publications of both its College Department and its Trade Department. Books pub- lished in 1947 will be featured, but all established publications ssued previously will also be exhibited. Noteworthy recent ooks include: *Semimicro qualitative organic analysis*, by Che- onis and Entriken; *Basic college chemistry*, by Babor; *Physical hemistry*, by Hunt; *First year qualitative analysis*, by Likes nd Harvey; *Exercises in organic synthesis*, by Sharefkin; *Experiments in science*, by Beeler and Branley; and *Famous men of science*, by Bolton.

Denoyer-Geppert Company

Chicago, Illinois

Booth Nos. 131 and 132

Denoyer-Geppert Company will have a display of anatomical and biological models, demonstration mounts, skeletons, corrosion specimens, Kodachrome slides, and charts for anatomy and biology.

Eastman Kodak Company

Rochester, New York

Booth No. 55

The Eastman Kodak Research Laboratories are engaged in an extensive research program on photographic materials for nuclear research work and also for the making of autoradiographs. The central features of the display will be photographs and transparencies showing results obtained with special photographic plates designated as Kodak Nuclear Track Plates. Typical examples of original slides will be available for examination under a microscope. Also included are photographs and transparencies of other applications of photography in science, such as photomicrography, electron microscopy, and photography in astronomy.

Edmund Salvage Company

Collingswood, New Jersey

Booth Nos. 35 and 36

The Edmund Salvage Company, which has specialized in retailing war-surplus optical items, will display a great variety of lenses and prisms. In addition, there will be telescopes, periscopes, and gun sights through which visitors may look. War-surplus bubble sextants, both new and used, will be on display along with astro compasses and drift meters. Beautiful desk name plates made from tank prisms will interest every scientific-minded person who visits the booths. Variable density polarizing filters will be available so that you may rotate them. You have probably read and heard a lot about the Navy's infrared snooperscope units. These will be on display at our exhibit so that you will be able to see for yourself how they work.

Gamma Scientific Company

New York, New York

Booth No. 43

The exhibit of the Gamma Scientific Company will feature the domestically manufactured products of its affiliate, Gamma Instrument Company, and also a number of recently imported items. Among the former will be the latest model of the well-known Microflex Photomicrographic Mirror Reflex camera, featuring all metal construction. A wide number of accessories for this camera such as the new Gamma Dura-Color Filter Set, illuminating devices for low-power photography in transmitted light and for macrophotography in reflected light will also be shown. Also on display will be the newly introduced photomicrographic desk, a complete line of Gamma pH meters for routine and research work, the Gamma Chambers' Micro-Manipulator and accessories. Among the imported items which will be demonstrated will be a Refractometer, a Polarimeter, and Precision Balances with air damping.

Garden City Engineering Specialty Company

Chicago, Illinois

Booth No. 46A

The Serdex Indicating Hygrometer and Microhygrograph (relative humidity), Dillon Bimetal Industrial Dial Thermometers, ASTM Thermometers, API Hydrometers, a complete line of precision, standard, and technical grade mercury in glass thermometers, Industrial Thermometers, Dial and Recording Thermometers, and Dial and Recording Pressure Gauges will be on display. Messrs. John C. Hayes, E. A. Johnson, and C. C. Hurst will be in attendance.

General Biological Supply House, Inc.

Chicago, Illinois

Booth Nos. 57 and 58

The Turtox booths will feature cultures of Protozoa, molds, and bacteria displayed by microprojection, and living marine specimens in tanks of sea water. A large collection of Kodachrome color transparencies will be on display and will be projected continuously. In addition, the entire series of more than 300 Turtox C-R Biological Charts and many recently published biological drawings in the series of Key Cards and Quiz Sheets will be available for inspection.

Gradwohl School of Laboratory Technique

St. Louis, Missouri

Booth Nos. 67 and 68

The display will be, as usual, in charge of Mrs. A. G. Erskine. Visitors will be welcome and will have every opportunity to discuss their problems. The display will consist of a photographic representation of many laboratory activities carried on in this school. Full literature will be available. Registrants are requested to leave their names and addresses for further particulars.

The Graf-Apsco Company

Chicago, Illinois

Booth No. 40

The exhibit of the Graf-Apsco Company is featuring rebuilt microscopes and microtomes and related supplies such as micro slides, cover glasses, magnifiers, etc. A complete line of dissecting and surgical instruments will also be displayed.

Harper & Brothers

New York, New York

Booth No. 64

Harper & Brothers will have on display all of their current college textbooks in the physical and biological sciences, mathematics, and psychology, as well as a number of medical books published by Paul B. Hoeber, Inc. (the Medical Book Department of Harper & Brothers) and many general trade books of interest to scientists. Particular attention is called to the new *Personality: a biosocial approach to origins and structures*, published in August, and *The essentials of plant biology*, by Frank D. Kern. The latter is a new textbook for the one-semester botany course, which has come from the press just in time to be included in the display.

W. A. Hammond Drierite Company

Xenia, Ohio

Booth No. 12

Industrial, laboratory, and home applications of Drierite in its Regular, Indicating, Du-Cal, and Moulded forms, will be displayed. A miniature two-tower drying unit, compartment desiccators for home and industrial use, new laboratory gas dryer, and a new, small, compressed air line dryer containing throw-away cartridges will be featured. Many other uses and applications of this product of science will be described or portrayed. Company personnel will be present to discuss the technical aspects of Drierite.

Instrument Development Laboratories

Chicago, Illinois

Booth No. 92

Instruments for the measurement of radioactivity will be the theme of Instrument Development Laboratories' exhibit. Pocket-size, portable and semiportable instruments for qualitative and quantitative determination of Alpha, Beta, and Gamma radiation will be in operation. Instrument Development Laboratories' new countomatic scaling unit will be on display, demonstrating flexibility of this automatic machine. The new Geiger counter, fountain pen dosage meters, and other radioactivity monitors for research, health monitoring, and geological surveying will also be shown. Engineers will be at the booth daily to suggest solutions to your instrumentation problems.

Jarrel-Ash Company

Boston, Massachusetts

Booth No. 71

Jarrel-Ash Company will feature an inexpensive spectrograph, source unit, and microphotometer with ample dispersion, resolution, and sensitivity for all spectrochemical analysis of biological or clinical materials. The equipment is suitable also for general spectrochemical work and for instruction in special methods in chemical analysis. Specialized optical instruments will include a Bellingham and Stanley Glass Circle Polarimeter reading to .01° and a less expensive Bellingham and Stanley instrument reading to .05°; a Bellingham and Stanley Standard Abbe Refractometer with glass scale read by transmitted light; a Projection Refractometer for the food industry; a Hilger-Mueller Double Monochromator f/4.0 1,850A. to 40,000A., with accurate wave length scale. Microscopic equipment displayed will include metallurgical, polarizing, research, and stereoscopic microscopes available for immediate delivery. There will also be a Precision Rotary Microtome, a photomicrographic camera, the new high-intensity Zirconarc for work at high magnification, and fluorescent lamps for low-power work.

W. H. Kessel & Company

Chicago, Illinois

Booth No. 18

On display for demonstration will be microscopes of various types and accessories, photomicrographic cameras, light sources for photomicrography, photometers for exposure deter-

ations, refractometers, pH meters, photoelectric and du-osq colorimeters, as well as laboratory instruments.

E. Leitz, Inc.

New York, New York

Booth No. 14

Leitz will show their Universal Microscope and Photomicro-aphic Apparatus "Panphot," which features a distinct parture from the conventional type of photomicrographic paratus. The first postwar model of the Leitz Research Mi-roscope, "Ortholux," will be displayed for the first time. This strument is equipped with a built-in light source and can be ed not only for transmitted but also for reflected light. tandard monocular as well as binocular medical microscopes ll be on display, as well as the well-known Photoelectric olorimeter. Another feature will be the Leica Camera and its ccessories for gross photography, photomicrography, and opying in both black and white and color.

Linguaphone Institute

New York, New York

Booth No. 4

Linguaphone presents the study of foreign languages in its ost scientific form—coordination-association of the sight of n object with the sound of the word it represents. A Lingua-hone course comprises a series of synchronized phonograph cords and books. While listening to the lesson on the record he student follows each word in the illustrated text, training ye and ear together. These lessons, graded in speed and sub-ct matter, are recorded by both male and female voices. upplementary books give full grammatical instruction. The ecords provide pronunciation and intonation. The result is fluency in thinking in the language in an amazingly short time. Linguaphone courses are available in 29 languages. The Lin-guaphone electric phonograph, fitted with earphones to ensure uninterrupted study at any time, will be displayed, as will the Classophone record-filing system, which can be installed in any bookcase or cabinet and which is the simplest, most practical method for protecting and classifying phonograph records.

McGraw-Hill Book Company, Inc.

New York, New York

Booth Nos. 52 and 53

The McGraw-Hill Book Company invites you to visit booths 52 and 53, where you will find recent and standard texts and reference books in agriculture, botany, chemistry, forestry, geology, health education, physics, psychology, and zoology. We urge that you check these authoritative, timely volumes and place your order for examination copies of those titles which are of interest in your particular program.

The Macmillan Company

New York, New York

Booth Nos. 2 and 3

The book exhibit sponsored by the Macmillan Company will consist of approximately 800 titles, including publications of the Cambridge University Press. In addition to undergradu-ate and graduate textbooks and reference works, there will be a large number of technical and scientific books of interest to the general reader. Books in the fields of various hobbies and avocations—photography, gardening, radio, outdoor life, and others—will be represented along with books of special interest to young readers. The major classifications are Agriculture, the Biological Sciences, Chemistry, Engineering, History and Philosophy of Science, Home Economics, Mathematics, Medical Science, and Physics. Representatives of the Macmillan Company at this exhibit will be Mr. Tyler Buchenau, science editor; Mr. C. J. Hylander, visual aids editor; Mr. Paul A. Carlson, Mr. Robert B. Davis, and Mr. Joseph G. Sutton, Jr.

G. & C. Merriam Company

Springfield, Massachusetts

Booth No. 106

The G. & C. Merriam Company exhibit will consist of a sample display of the various publications of the company, which are as follows: Webster's *New international dictionary* (2nd ed.), Webster's *Collegiate dictionary* (5th ed.), Webster's *Dictionary of synonyms*, and Webster's *Biographical dictionary*. In addition, there will be displayed for distribution copies of various pamphlet material dealing with instruction in, and the use of, the various books mentioned above. Souvenirs will be provided.

The C. V. Mosby Company

St. Louis, Missouri

Booth No. 24

Visitors to the International Science Exhibition are cordially invited to examine the books on display at the C. V. Mosby Company booth. Among the titles on display will be the following new releases: Rogick, *General zoology laboratory manual*; Bellafiore, *Pharmaceutical arithmetic*; Novak-Meyer, *Bacteriology laboratory directions for pharmacy students*; Schaub-Foley, *Diagnostic bacteriology*; Potter, *Textbook of zoology*; Atwood, *A concise comparative anatomy*; Cureton, *Physical fitness, appraisal and guidance*; Turner, *School health and health education*; and Iddins, *Workbook for physical education*. The complete line of Mosby texts and reference books will also be exhibited.

National Geographic Society

Washington, D. C.

Booth Nos. 82 and 83

The exhibit will show one of the battery of huge telescope cameras focused on the eclipse of the sun by the Army Air Forces-National Geographic Society Solar Eclipse Expedition at Bocaiuva, Brazil, May 20; also, samples of rock from submarine mountains in the Atlantic Ocean, dredged up last summer by the Mid-Atlantic Ridge Expedition sponsored by the Society, Columbia University, and the Woods Hole Oceanographic Institution. Photographs illustrating interesting features of the Society's recent scientific projects will form a fascinating backdrop for the exhibit.

Philosophical Library

New York, New York

Booth No. 8

Visitors to the Exhibition are cordially invited to visit the booth of the Philosophical Library. Some of the books which will be featured are: *The selected writing of Benjamin Rush*, by

Dagobert D. Runes (editor); *Existentialism*, by Jean-Paul Sartre; *How our minds work*, by C. E. M. Joad; *Hindu philosophy*, by Theos Bernard; *The new dictionary of psychology*, by Philip Lawrence Harriman; *Unusual words and how they came about*, by Edwin Radford; *Studies in genius*, by Walter G. Bowerman; *Old Korea*, by Elizabeth Keith; *Physics of the 20th century*, by Pascual Jordan; *Science since 1500*, by H. T. Pledge; *Charles Darwin and the voyage of the Beagle*, edited by Lady Nora Barlow; *The tyranny of time*, by Chalinder Allen; *The dictionary of philosophy*, edited by Dagobert D. Runes; *Essays in science and philosophy*, by Alfred North Whitehead; *Spinoza portrait of a spiritual hero*, by Rudolf Kayser; *The great beyond*, by Maurice Maeterlinck; *The creative mind*, by Henri Bergson; *Logic for the millions*, by A. E. Mander; and *Narcotics and drug addiction*, by Erich Hesse, M.D.

Alvin F. Polan
Baltimore, Maryland
Booth No. 25

The specimens of plants, insects, and animal tissue in this exhibition are preserved by a quick process which fixes the actual color and physical appearances of the specimens indefinitely. The specimens that are exposed to the air will not decay or disintegrate and many retain their natural odor. There are no signs of the preservative treatment on the subject matter after processing the specimens.

Prentice-Hall, Inc.
New York, New York
Booth No. 42

Prentice-Hall, which will be represented by Associate Editors Frank Bitner and Warren Blaisdell, will feature a display of over 100 College and Industrial Department books in the fields of chemistry, physics, mathematics, engineering, geology, and geography, psychology, and statistics. New books which will be available will include *Advanced calculus*, by David V. Widder; *College algebra*, by Moses Richardson; and *Mental hygiene*, by Herbert A. Carroll. By arrangement with the Editorial Department page proofs on important forthcoming texts, including *Organic chemistry*, by Ray Q. Brewster, will be available for inspection.

Radiation Counter Laboratories, Inc.
Chicago, Illinois
Booth No. 66

Instruments for measurement of radioactivity will be shown

W. B. Saunders Company
Philadelphia, Pennsylvania
Booth Nos. 72 and 73

The W. B. Saunders Company cordially invites visitors to the Exhibition to stop in at booths 72 and 73, where a fine selection of our publications will be displayed. Our representatives will be glad to show you the many new books and new editions which have been published in 1947. Botanists will be particularly interested in the new (2nd) edition of Weatherwax' *Plant biology*. The brand new *General botany laboratory book*, by Dr. Edward M. Palmquist and Dr. Loren C. Petr... can be used to very good advantage with Dr. Weatherwa... book or with any other standard text. Another new book ... interest to all is Dr. Ernest Gardner's *Fundamentals ... neurology*. The 1947 editions of Ranson-Clark's *Anatomy ... the nervous system* and of Rice's *Textbook of bacteriology* ma... also be seen. The new (21st) edition of *American illustrat... medical dictionary*, containing over 2,000 new words, will ... of interest to all scientists. The representatives present duri... the Exhibition will be Messrs. O. G. Enstrom, James B. Fin... C. O. Wheeler, and E. R. Zieber.

Schering Corporation
Bloomfield, New Jersey
Booth No. 6

The Schering exhibit will feature the newly discovered pri... ciple of sulfonamide therapy which practically eliminates a... danger of toxicity from "sulfa" drugs. The result of laborato... and clinical researches supported by Schering Corporation, ... Bloomfield and Union, New Jersey, this discovery is based o... increased solubility through the use of a mixture of thr... sulfonamides, resulting in increased effectiveness with d... creased renal toxicity and crystalluria. The concentration ... solubility of one sulfonamide in a solution does not affect, an... is not affected by, the amount of another sulfonamide in th... same solution. This holds true if there are three sulfonamid... present. Thus, only one-third of the usual dosage of each sulfo... amide need be given to obtain a potentiated therapeutic effe... The probability of crystalluria when full dosage of any o... drug is given is also nearly eliminated. Combinations ha... proven more effective, in shorter periods of time, with small... changes. Schering's Combisul tablets or liquid are mixtures ... sulfadiazine, sulfathiazole, and sulfamerazine in equal part... Lehr substantiated these facts through original work, pu... posely avoiding alkalization, and found that crystalluria st... does not occur. Flippen declared that alkalization may destro... some of the sulfonamides' effectiveness.

Tracerlab, Inc.
Boston, Massachusetts
Booth No. 19

The Tracerlab exhibit features the Autoscaler, a fully auto... matic radioactivity counting instrument. The output circu... of the Autoscaler is coupled to a large neon bulb countin... indicator to permit visitors to watch the progress of demonstra... tion radioassays. In addition, the exhibit will include the "64... scaler and radioactivity health survey and monitoring instru... ments together with a full line of accessories for radioactivity ... work including G-M tubes, sample changers, and specialize... chemical equipment.

Copies of *Tracerlog*, a technical monthly publication dea... ing with all phases of radioactivity, and bulletins describin... equipment and services of Tracerlab, Inc., will be availabl... for free distribution.

Representing the company at the exhibit will be Mr. Dan... W. Atchley, Jr., sales manager; Mr. Alan P. Schreiber, sale... engineer; and Mr. Walton C. Wickett, Western repre... sentative.

The Technicon Company

New York, New York

Booth Nos. 48 and 49

The Technicon booth will feature the new Technicon Automatic Fraction Collector for Chromatographic Analysis. This is a machine which collects specific quantities of effluent fluid from the chromatographic column. The machine will automatically distribute as much as 4,000 cc. of fluid in as many as 200 test tubes, automatically placing a set and rigidly controlled amount in each tube. The automatic tissue-processing machine, the Autotechnicon, as well as the Lab-Aid slide filing cabinets, and the Scopicon, a microscopic projector, will be shown. The Technicon Automatic Pipette Washer and the Technicon Constant Temperature Water Bath for spreading paraffin sections will also be exhibited.

University Presses

Chicago, Illinois

Booth No. 97

The University Presses, leaders in the field of nonfiction, each year publish a large number of important titles. Many of these gain lasting recognition as reference books and college texts. Many also enjoy wide popularity as trade publications. All are reaching a constantly increasing audience. The exhibiting of books from University Presses is an outgrowth of the Association of American University Presses. Each press represented is a separate publishing company devoted to the production of important technical and scholarly works which might otherwise go unpublished, as well as general books of vital interest to all Americans. Because of their common goals, and because some of them are too small to sponsor exhibits alone, these presses have combined to present their books in a single impressive display.

W. M. Welch Manufacturing Company

Chicago, Illinois

Booth Nos. 102, 103, and 104

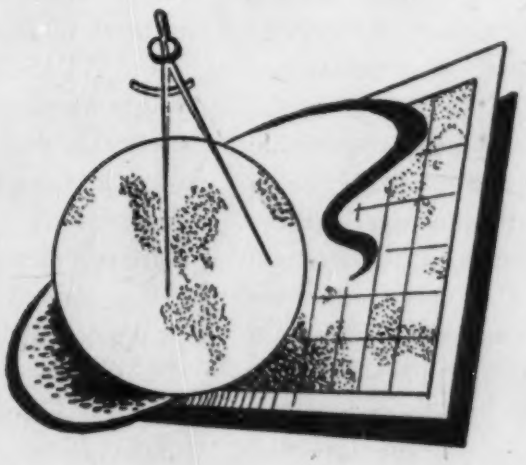
A variety of laboratory equipment and supplies will be shown. Of interest to physicists will be vacuum pumps and gauges, voltmeters, ammeters, wattmeters, ohmmeters, and A.C. and D.C. instruments in three accuracy ranges; student and demonstration equipment for mechanics, heat, electricity, sound, and light; balances, both analytical and stainless steel; chart of electromagnetic wave gamut; aeronautics charts; wind tunnel; replica gratings; and spectrometer. Equipment for use in the field of chemistry will include glassware, hardware, rubberware, straight-jacket condenser, balances, the 1947 edition of the Hubbard Periodic Chart, and Chart of Organic Chemistry. The biological sciences will be represented by a display of living and preserved specimens; microscopes; prepared slides; charts of physiology, health, hygiene, safety, and first aid; and botanical and zoological charts.

John Wiley & Sons, Inc.

Philadelphia, Pennsylvania

Booth No. 95

John Wiley & Sons, Inc., New York scientific and technical publishers, will utilize their centrally-located booth for displaying a comprehensive collection of late and standard books in various fields of pure and applied science. While stress will be laid on 1947 publications, Wiley plans to show a full range of titles which have earned recognition as outstanding texts, manuals, handbooks, or other works of reference. Many of these will be found in new, revised editions. Fields of interest covered will include aerodynamics, agriculture, anthropology, astronomy, the biological sciences, chemistry, education, the earth sciences, mathematics, public health, physics, psychology, social and political science, and business.



Obituary

Otis William Caldwell
1869–1947

"Our lives," said Dr. Caldwell, "are for what we may do, not for what we have done." To this design for living he adhered faithfully until the very end, which came on July 5, 1947.

Otis Caldwell blazed a trail in the two great enterprises of the modern world—science and education. For him the two enterprises were one. That was the essence of his outlook and of his contribution. Along every part of the trail, which stretches back more than half a century, he was surrounded with friends and followers whom he attracted and inspired.

While it is customary to trace a man's career from youth onward, Caldwell's work can be better understood by reversing that direction. The great concern of his later years was the American Association for the Advancement of Science. He held the post of general secretary, to which office he gave every ounce of his abundant energies and every facet of his fine mind. This was the golden opportunity of his life. He regarded our association of scientists as the most potent single force in the life of the Nation. He suffered a sense of hurt when scientists were ignored by statesmen. To make them understand what science can do for society became the absorbing interest of his life. There were two things to be done: Scientists themselves must be persuaded to give some of their precious time to the problems of people, and the people must become more aware of the new world being built by science. "What science may *do for men* is not enough," said Caldwell. "This must become subordinate to what science may *do to men*. Knowledge must be directed toward common needs of common men as well as toward the advancement of knowledge itself."

As general secretary, Caldwell was largely responsible for the AAAS Committee on the Place of Science in Education. Having experienced both the joys and the tribulations of the laboratory scientist, he understood why the man of science is reluctant to move out of his field of special competence. Yet his charm of manner and his wisdom brought top-rank scientists to his side in the work of improving science teaching in schools and colleges. Having been a professor of education, Caldwell was also "at home" with school administrators and educationists. To these groups he brought the essence of the scientific spirit, demonstrating the need for it in curriculum construction and in educational procedures. Thus, he helped to bring together two fields which diverge too often, to the detriment of both. In the last year of his life Caldwell was invited by the National Society for the Study of Education to write the capstone chapter in *The 46th yearbook*, devoted to science education in American Schools. The chapter closes with this paragraph:

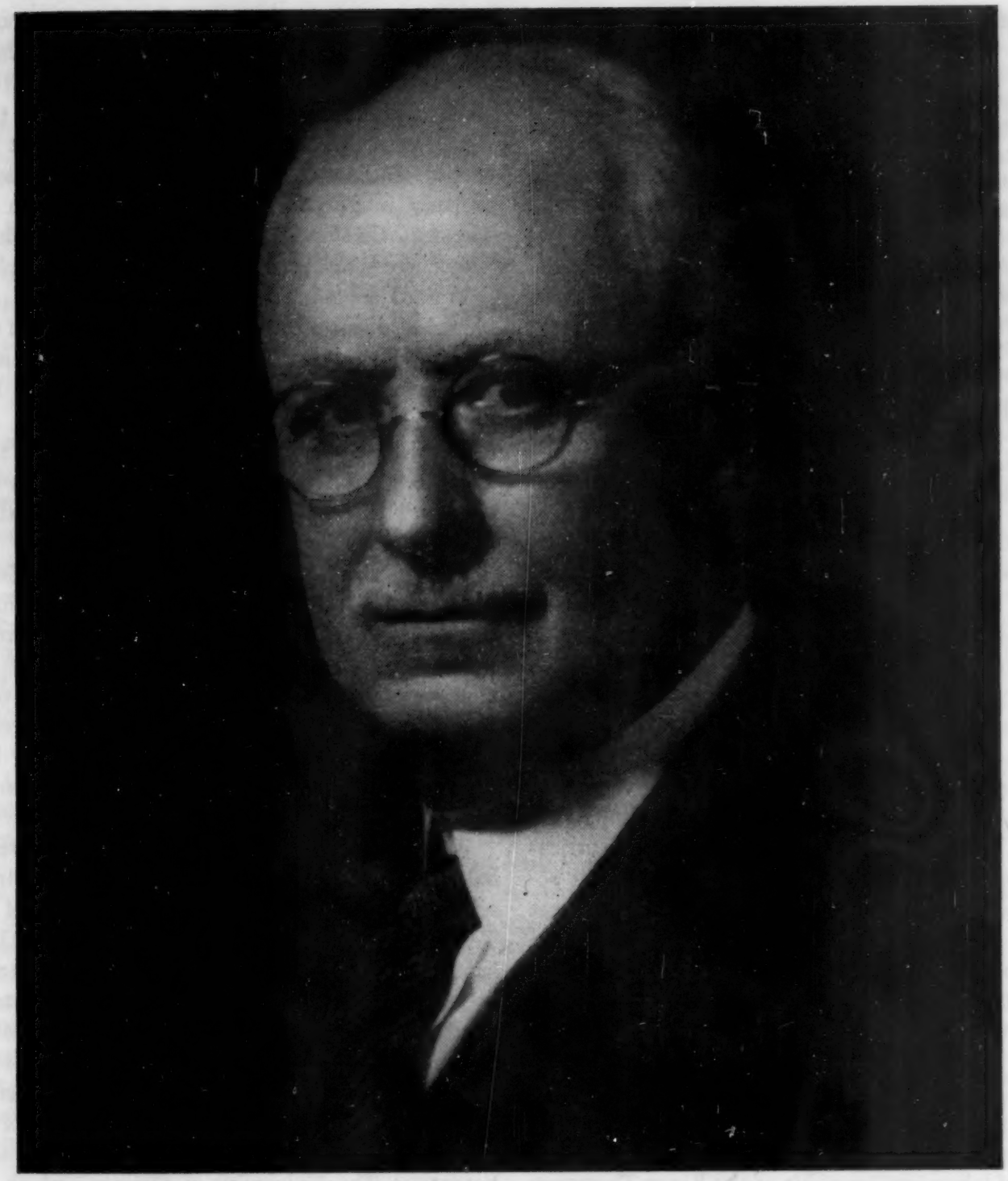
> Science education, therefore, seems imperative if society seeks security. Yet science education can not guarantee security. Security rests not only in men's knowledge but in their characters. The will to do what is right transcends knowledge of how to do what is right. Science may contribute knowledge and understandings. Their ways of working may exhibit the unprofitableness of errors, but educated human character must assume the decisive role in civilization's future.

The State Academies of Science and the Junior Academies of Science were another fertile field for the energies of the general secretary. By persistence and eloquence he heightened the interest of the Association in this work. Through unceasing effort he brought scientists, teachers, and youth together in many states throughout the Nation. This work with young people was the precursor of the science club movement and of science talent searches. The AAAS Committee on Junior Scientists Assembly was inspired by Dr. Caldwell. The first of these Assemblies, held in Boston in December 1946, created unusual interest. For the first time, young scientists were welcomed to take part in the program of adult scientists. Caldwell saw clearly the need for continuous recruitment of youth to the ranks of science. He was appalled at the losses in scientific personnel brought about by the war, and he feared the impending shortages of scientists and technologists.

The AAAS-George Westinghouse Science Writing Awards were another Caldwell project. His concern with "science in our lives" had led him early to an examination of newspapers, magazines, and world affairs. His famous study, "Biology in the Public Press," was a pioneering effort that touched off many similar studies. In these annual awards to science writers Caldwell found new opportunities to bring good science to all the people.

Dr. Caldwell was the patron saint of the AAAS Cooperative Committee on Science Teaching and the founder of the National Science Teachers Association. This group, numbering several thousand science teachers and teaching scientists, is an affiliate of the AAAS and, at the same time, the department of science instruction of the National Educational Association.

When Caldwell was 75, a group of his colleagues and



OTIS WILLIAM CALDWELL

former students (he called them his Dependable Associates) prepared manuscripts for a brochure entitled *Looking ahead in education*. This was published by Ginn and Company in 1945 and has had wide national circulation. In each chapter of this work we find a bit of the essence of Caldwell's outlook on life. Scientists, teachers, psychologists, mathematicians, administrators, sociologists, and economists all join in projecting his philosophy into the future. They point up the Caldwell drive toward an education for our times based upon imagination and intelligence and recognizing the vital role of science in social progress.

When Caldwell reached 70 years of age, another group of faithful friends compiled a volume of greetings which expressed the deep appreciation of 150 loyal colleagues, grateful students, and parents. The volume was presented to Dr. Caldwell at a luncheon during the meetings of the AAAS in Columbus, Ohio. Two excerpts from these greetings reveal another facet of Dr. Caldwell's personality, so important in all that he did. One was from a parent of the school which he directed:

> And then we sat down and talked to you, and asked you a lot of unintelligent questions, but they were things that were in our hearts and minds. And then we enrolled the first child. And shortly thereafter, the second child, and not so long after that, the third child. And then we made friends with you and the school—you and the school were really one. And in a few years, you built up a magnificent educational institution, you built up traditions, and you made both children and parents happy.

And the other was from Helen Keller:

> We feel twice blest in you as a friend of man and as a scholar who breathes new vitality into many old forms of knowledge.
>
> In you shines truly the spirit of America. It is the American heritage—to think and experiment for oneself, to apply science freely for the benefit of all the people—that teachers like you in the sense of creators arise among us.
>
> Many will honor you for the breadth of your sympathies in quickening young minds and finding constructive solutions for baffling individual problems. With emotion I thank you for the unique tenderness that has moved you to use your immense learning and resources for the blind also. It is a boon to them past computing to have you help them discover their own powers of self-expression and of disciplining their fettered bodies to a creatively shaping will. Affectionately I salute you as a gracious beacon spreading its rays over all the highways and byways of the people's development.

Dr. Caldwell retired from the directorship of the Institute of School Experimentation of Teachers College, Columbia University, at the age of 65. He left behind him the Lincoln School. Those of us who are today still fighting for adequate representation of science in the curriculum can understand why he seized the opportunity of directing a school. The Lincoln School of Teachers College is world famous. Conceived by the Caldwell mind, it lighted a flame which is still burning vigorously in all curriculum laboratories. The Lincoln School placed science at the core of the educative process. Its curriculum determined the physical plant which was built according to the Caldwell blueprint. He gathered a great faculty of broadly educated and competent men and women who became the living examples of a sound program of teacher training. In that school science was much more than a subject to be taught; it was a phase of life to be integrated with all other aspects of child experience.

When Dr. Caldwell retired from his post at Teachers College, he indulged his earliest interest by returning to the work of laboratory scientists at the Boyce Thompson Institute for Plant Research. From that vantage point he carried on as general secretary of the AAAS, where his matured philosophy of science education found new outlets and widened scope.

Science was a way of life to Dr. Caldwell. He could not and would not tolerate prejudiced thinking. What, then, should be done to rid the world of such thinking? The typical Caldwellian answer can be found in his two widely read books: *Science remaking the world* and *Do you believe it?* In the first, he asks that "intellectual and moral ideas shall develop in harmony with modern science." In the second, he subjects man's common superstitions to the cold, blazing light of scientific reason.

"Ignorance and superstition," says Caldwell, "contribute to one another. Knowledge is the enemy of both. In childhood, as with older people, the attitude of desiring knowledge is in itself like an insurance policy that has been secured against superstition. But like any other insurance policy, it is a protection against the event when encountered and not a guarantee that the event cannot occur. Those who fear ignorance but have no fear of truth, need have no fear of superstition. Facts properly interpreted and used make freedom possible. The text that is frequently used about truth making people free is not yet in danger of excessive application."

Trained as a botanist, he knew well the part that biological sciences can play in the education of children. He knew, too, that the essence of this contribution is to be found in all the sciences. With true vision he threw himself into the General Science movement, bringing it to fruition in the schools of the Nation. His textbooks have been and are still being read by millions of school children all over the world, as are also his textbooks in biology.

In 1920 Dr. Caldwell, as chairman of the Committee on Science of the Commission on the Reorganization of Secondary Education, crystallized the pattern of the science curriculum. In this report, science teachers could see clearly for the first time, a sequence of science studies that gave dignity and scope to their efforts. It was Dr. Caldwell again who showed the way in extrapolating that sequence to include the elementary school at one end and the junior college at the other.

We have now followed the trail which Caldwell blazed half way toward its beginning. In 1919 he electrified the science teaching world with his survey of Science Teaching in the Gary Public Schools. In 1917 he had left his post at The University of Chicago, where he had been associate professor, then professor of botany, and finally in charge of science teaching at the School of Education. He had come to the University in 1907 from the Eastern Illinois State Teachers College, where he had held the post of head of the Department of Biology since 1899. From 1897 to 1899 he had been assistant in botany at The University of Chicago, which granted him a Ph.D. degree in 1898. His undergraduate work was done in Franklin College, from which he received the B.S. degree in 1894. Later, in 1917, his alma mater bestowed upon him the degree of LL.D. Otis Caldwell was born on December 18, 1869, in Lebanon, Indiana, where he spent his early youth.

Edwin G. Conklin, renowned biologist and past president of the AAAS, once wrote to Dr. Caldwell as follows:

> Any man who has lived for more than seventy years amidst all the dangers and vicissitudes of life is a biological triumph of adaptation, endurance and good fortune. When in addition he has lived a life of marked intellectual and social leadership and has left his mark not only on his generation but also on future ones, he is one of the immortals.

MORRIS MEISTER, *Principal*

The Bronx High School of Science

NEWS *and Notes*

A Memorial Service for Otis W. Caldwell, whose obituary appears in this issue, was held at the Church of the Redeemer, Yonkers, New York, on Sunday, December 7, at 4:00 P. M. Those participating in the service included Barclay Acheson, Kirtley F. Mather, Morris Meister, H. Otheman Smith, J. Wayne Wrightstone, and P. W. Zimmerman.

With regard to Dr. Caldwell's passing, the Executive Committee of the Association has made the following statement:

In the sudden death of Dr. Otis W. Caldwell on July 5, 1947, the Executive Committee of the American Association for the Advancement of Science lost its member of longest service, and a colleague who had been a member of the Association continuously since 1900, a Fellow since 1902, and a life member since 1923. Very few persons have been members of the Association longer than Dr. Caldwell, and probably none has as thorough a knowledge of its hopes, plans, and operations as he had. He was vice-president of the Association for the Section on Education in 1925, General Secretary from 1935 until his death, and the principal connecting link between the Association's administrative officers and the 37 affiliated academies of science.

The Executive Committee shares the grief of Mrs. Caldwell and of other members of Dr. Caldwell's family at his passing, and will long cherish his memory as one of the foremost of the loyal men who have made of the Association a great factor in the advancement of science. And even after his many friends and associates shall have passed, the expanding effects of his devotion to the high purposes of the Association will still be felt.

George A. Baitsell, Osborn Zoological Laboratory, Yale University, has recently been appointed Colgate professor of biology and executive officer.

Edward C. Miller, formerly assistant professor of metallurgical engineering, Purdue University, has been appointed associate professor of chemical and metallurgical engineering, Wayne University College of Engineering.

Henry F. Donner, chairman, Department of Geology and Geography, and professor of astronomy, Western Reserve University, will be granted a leave of absence, beginning in February, to drive, with his wife, from the northern coast of Africa to the Lamont-Hussey Observatory in Bloemfontein in Orange Free State. On the way down, they will inspect various volcanoes, mountains, and particularly the Rift Valleys, where some geologists believe the continent is breaking in two. They will also visit the mountain Thaba 'Nehu, in South Africa, which is believed to have broken away from the Malute Range in Basutoland ages ago.

On his first visit to Africa in 1928–33, Prof. Donner made a series of measurements of more than 1,100 binary stars which he had discovered in the southern constellations. On the coming trip, Prof. Donner expects to use the Observatory's 27-inch refractor to determine how far each star in the binary pairs he discovered has moved since 1933. He hopes to make another series of observations in 15 years in order to complete a final report which will provide information about the sizes and masses of the stars.

Lincoln Constance, professor of botany and curator, Seed Plant Collections, University of California, is spending the academic year as visiting lecturer of botany, Harvard University. Until July 1, Prof. Constance is serving as acting director, and **Robert C. Foster** as acting curator, of the Gray Herbarium.

Wellington D. Jones, professor emeritus, University of Chicago, recently spent two weeks with the Department of Geography at Syracuse University. His principal talks centered around the subject of "What Geographers Need to Know About Soils and Associated Land Use."

Orville L. Gilpin, paleontological technician, Chicago Natural History Museum, has been appointed chief preparator of fossils in the Department of Geology.

Arthur David Howard, U. S. Geological Survey, has been appointed associate professor of mineral sciences at Stanford University. Dr. Howard assumes his new duties in January 1948.

Stanley S. Ballard, professor of physics and chairman, Department of Physics, Tufts College, has recently been appointed to the new office of the Secretary for Local Sections of the Optical Society of America for a two-year period.

Arthur Harmount Graves, curator emeritus, Brooklyn Botanic Garden, who is now living in Wallingford, Connecticut, will continue his work on the breeding of disease-resistant chestnut trees and on the nature of disease resistance, under a cooperative agreement with the Connecticut Agricultural Experiment Station. Dr. Graves will also furnish propagative material to the Station. The work is being sponsored also by the Connecticut Geological and Natural History Survey and the Division of Forest Pathology, Bureau of Plant Industry, Soils, and Agricultural Engineering, U. S. Department of Agriculture.

Harry S. Mustard, director, School of Public Health, Columbia University, has recently been made commissioner of public health for New York City.

Visitors to U. S.

Francis Hemming, of London, secretary to the International Commission on Zoological Nomenclature and a well-known entomologist, will arrive in the United States on December 18. Mr. Hemming is coming, at the invitation of the Smithsonian Institution, to promote understanding and cooperation between American zoologists and the International Commission. He will address a meeting in the National Museum auditorium in Washington, D. C., on the evening of December 22 at 8:00 P. M., to which all interested zoologists and paleontologists are invited. He will also address a joint meeting of the several societies of zoologists meeting with the AAAS in Chicago at 3:30 P. M. in the Upper Tower Room of the Stevens Hotel on December 29 and a joint meeting of the Paleontological Society and Society of Vertebrate Paleontology at the Chateau Laurier, Ottawa, on the morning of December 31. Mr. Hemming is anxious to meet and confer with zoologists or groups of geologists

at Washington, Chicago, Ottawa, and perhaps other points. He will be accompanied by his wife, Mrs. Margaret F. W. Hemming, who is his personal secretary.

T. A. Stephenson, professor of zoology, University of Wales, and author of a comprehensive monograph on the British sea anemones, has been visiting American laboratories, accompanied by his wife, to gather information on marine ecology. Dr. Stephenson is currently holding an appointment as visiting professor of zoology at the Scripps Institution of Oceanography (University of California), La Jolla.

Grants and Awards

The Council of the Royal Society, England, has awarded Royal Medals to **C. N. Hinshelwood** and **F. M. Burnet.** Prof. Hinshelwood received the award in recognition of his distinguished work on the mechanism of chemical reactions from the simplest gas phase processes to the complexities of cell division; Dr. Burnet, for his distinguished work on bacteriophages, viruses, and immunity, and for his contributions to the study of infectious disease as an ecological phenomenon.

The following awards of medals have also been made by the President and Council of the Royal Society: the Copley Medal, to **G. H. Hardy** for his outstanding part in the development of mathematical analysis in England during the last 30 years; the Davy Medal, to **Linus C. Pauling** for his distinguished contributions to the theory of valency and for their application to systems of biological importance; the Buchanan Medal, to **Sir Edward Mellanby,** for his distinguished researches on the physiology of nutrition, especially in relation to the causation of deficiency diseases; and the Hughes Medal, to **J. F. Joliot** for his distinguished contributions to nuclear physics, particularly the discovery of artificial radioactivity and of neutron emission in the fission process. Dr. Pauling, head, Division of Chemistry, California Institute of Technology, was unable to receive the medal in person December 1, but will soon leave for England, where he will be Eastman professor at Oxford University for the second and third terms.

Clarence W. Balke, Fansteel Corporation, and formerly professor, University of Illinois, has been awarded the 1948 Perkin Medal of the American Section of the Society of Chemical Industry. Dr. Balke, who will receive the medal at a dinner in New York on January 9, is honored for his research in chemistry and metallurgy which led to the development of processes for the production and commercial utilization of tantalum and its sister element, columbium.

Chester G. Fisher, president, Fisher Scientific Company, Pittsburgh, and of Eimer & Amend, New York, will receive the 1947 Pittsburgh Award, a bronze plaque, at a dinner, December 18, at the University Club, Pittsburgh. The award, made annually by the Pittsburgh Section of the American Chemical Society, will be presented "for outstanding contributions to chemistry in the Pittsburgh area." In 1902 Mr. Fisher founded the Fisher Scientific Company, which has grown into one of the Nation's leading suppliers of scientific equipment, apparatus, and laboratory chemicals.

Walter J. Murphy, editor of *Industrial and Engineering Chemistry* and *Chemical and Engineering News,* publications of the American Chemical Society, recently received the honorary D.Sc. degree from Centre College.

Niels Bohr, Nobel Prize winner in physics, has been awarded the Order of the Elephant, highest decoration in Denmark. A dispatch from Science Service indicates that this decoration is one of the oldest in the world, dating back to 1458. Dr. Bohr is the second Danish commoner to receive it during the present century.

Lawrence K. Frank, director, Caroline Zachry Institute of Human Development, New York, and **Catherine Mackenzie,** parent-child editor, *New York Times,* received jointly the fourth annual $1,000 Lasker Award of the National Committee for Mental Hygiene at its 38th annual luncheon, November 13, at the Pennsylvania Hotel, New York. The award was given this year for "contributions to popular adult education in mental health, especially concerning parent-child relationships."

Paul Niggli, Zurich, Switzerland, will be awarded the Roebling Medal of the Mineralogical Society of America at its annual meeting in Ottawa, Canada, December 29–31. Prof. Niggli, who plans to lecture at several universities in this country during January, is the second person from another country to receive this honor, the highest that American mineralogy has to offer for outstanding achievement in its science.

The School of Veterinary Medicine, University of Pennsylvania, has received a grant of $75,000, in amounts of $25,000 per year for three years, from the Grayson Foundation, Inc., for the study of equine infectious anemia. The grant will be used to further research in the development of improved methods of diagnosis, prevention, and treatment of the disease.

Fellowships

Antioch College, Yellow Springs, Ohio, has announced the establishment of a fellowship for research in problems of land use, available to an outstanding graduate in the field of forestry, agriculture, wildlife management, or conservation education. The fellowship is financed by the Hugh Taylor Birch endowment, and the research will be concerned with the development of Glen Helen, a 920-acre tract given by Mr. Birch to Antioch College. Inquiries should be addressed to Kenneth W. Hunt, director of Glen Helen.

The Graduate School of Ohio State University has announced the availability of several scholarships and fellowships for the year 1948–49. The Elizabeth Clay Howald Scholarship, with an annual stipend of $3,000, will be given to a person who has shown marked ability in some field of study and has in progress work, the results of which promise to constitute important additions to our knowledge. Two Muellhaupt Scholarships in Biology, with annual stipends of $1,800 to $3,000 each, are offered to the candidates who are considered most likely to promote, by original research, one of the biological sciences, particularly botany, bacteriology, physiology, and zoology. Candidates must have completed requirements for the Ph.D. degree or its equivalent. Postdoctoral fellowships and scholarships for study in a variety of fields are also available, their stipends ranging from $1,800 to $3,000 for a year, generally beginning July 1. Applications for all those mentioned must be filed with the Dean of the Graduate School by April 1.

Also available to graduate students are

several University Fellowships and Scholarships, with stipends ranging from $400 to $900, and several special endowed Fellowships with stipends ranging from $450 to $1,000. In addition, all fees are remitted except matriculation and graduation fees. University Fellows and Scholars are selected on the basis of merit, irrespective of field, while Special Fellows are for designated fields, but selections within this field are based on merit.

Ethyl Corporation has awarded 9 graduate fellowships in the fields of petroleum, automotive, and chemical research, which provide students with scholarship grants plus tuition. Thus far this year, the fellowships have been created at the University of Michigan (two), Princeton University, University of Tulsa, Wayne University, University of Oklahoma, Louisiana State University, Purdue University, and the University of Texas. A postdoctoral fellowship, the first of its kind offered by the company, has been established at the University of Cincinnati, for study under Robert A. Kehoe, director of the Kettering Laboratory and medical director of Ethyl Corporation. The fellowship program was established 10 years ago to stimulate and aid students who show promise in advanced industrial and engineering research. Recipients are not obligated to work for the company upon completion of their academic work, nor are they restricted as to their courses of study, except that the academic projects be related to the petroleum, automotive, or chemical industry.

Colleges and Universities

The Department of Biology, Johns Hopkins University, has added the following men to its staff: **Francis T. Haxo,** Hopkins Marine Station of Stanford University, as instructor in plant physiology; **V. G. Dethier,** formerly of the Department of Zoology and Entomology, Ohio State University, as associate professor to work in the field of sensory physiology of insects; and **H. Bentley Glass,** geneticist, formerly of Goucher College, as associate professor of biology.

The University of Delaware is offering a new extramural course this year in "Application of Statistical Methods to Design of Experiments and Analysis of Data." This course, a relatively new approach to industrial experiment work, is being offered because a definite need has been evidenced in application of statistical methods to industrial experiments. In charge of the course is **George E. Hulse,** head of scouting research, Hercules Powder Company. Dr. Hulse will be assisted by **Donald S. Villars,** head, Science Department, Jersey City Junior College, who will give 10 of the 14 lectures; **John A. Zapp, Jr.,** Research Department, Haskell Foundation, E. I. du Pont de Nemours and Company; **Vernon Lewis,** also of Du Pont: and **W. L. Gore,** research chemist in plastics at Du Pont's Arlington, New Jersey, Laboratory.

Union College, Schenectady, New York, will expand its facilities for studying child behavior by constructing a new wing to the present psychology building. The addition will include a child observation room, with extensive sound and visual equipment, to add to the facilities for the scientific recording of the behavior of children, and new classroom and office space. The new wing is made possible by an anonymous gift.

Rensselaer Polytechnic Institute is now equipping a new nuclear chemistry laboratory to augment its nuclear science and engineering program, which will be opened to students of the Graduate School in February. The laboratory will provide facilities for training and research in connection with the course in nuclear chemistry inaugurated by the Institute in September. **H. M. Clark,** assistant professor of physical chemistry, who spent last year at the Clinton Laboratories, Oak Ridge, directs the course.

The Technological Institute of Northwestern University has opened a new laboratory for the teaching of catalytic and high-pressure processes in chemistry, which is named in honor of Vladimir N. Ipatieff. The laboratory was officially opened November 22, on the 80th birthday of Dr. Ipatieff. The principal speaker for the occasion was Robert E. Wilson, chairman of the Board, Standard Oil Company of Indiana. Other speakers included Kenneth M. Watson, professor of chemical engineering, University of Wisconsin; Robert K. Summerbell, chairman, Department of Chemistry, and Virgil C. Williams, chairman, Chemical Engineering Department, both of Northwestern University; and Ovid W. Eshbach, dean, Technological Institute. After the program and tours of the laboratory, a private luncheon honoring Dr. Ipatieff was held in the dining hall of the Northwestern University Apartments. Brief congratulatory talks were made by Franklyn B. Snyder, president, Northwestern University; Edwin F. Nelson, vice-president, Universal Oil Products Company; and Ward V. Evans, professor emeritus of chemistry at Northwestern.

"Spinning discs" are being used to test welds and steels in an interesting research program at Massachusetts Institute of Technology sponsored by the Welding Research Council of the Engineering Foundation and directed by **C. W. MacGregor,** professor of applied Mechanics. In an armor-plated pit 40 inches in diameter and 9 feet deep these steel plates are suspended on a flexible steel drive shaft and rotated in a 30-inch vacuum at speeds up to 35,000 r.p.m. The vacuum serves to prevent generation of heat, and when air is admitted, the whirling may be stopped when desired. Under such high speeds the material flows toward the edges, thickening the discs at the perimeter. According to W. Spraragen, director of the Council, this method, when perfected, will find valuable use in testing materials and welds at extremes of temperature, and the results may ultimately be applied in bridge building, ship building, and wherever steel is used at low temperatures.

Illinois Institute of Technology has launched a $15,000,000 development and expansion program which will transform its Technology Center campus into a functionally planned study and residential area for 10,000 persons, covering the 100 acres from 31st to 35th Streets, and from Michigan Avenue to the New York Central Railroad tracks. The architecture was created by Ludwig Mies van der Rohe, chairman of the Institute's Department of Architecture. Three buildings have already been completed and are in use: a Metals Research building, a wing of the Engineering Research building, and Alumni Memorial Hall. Now being completed are a Chemistry building and a Metallurgical and Chemical Engineering building. Also under construction are two student dormitories. Fifty-nine additional aca-

demic, laboratory, campus, and housing structures will be erected over a five-year period. Included in this giant plan are buildings for Mechanical Engineering, Civil Engineering and Mechanics, Electrical Engineering and Physics, Architecture, an Institute of Gas Technology, and two research laboratories for the Armour Research Foundation. When completed, the Technology Center will be one of the Nation's most modern centers of technological education and research.

Development of an electronic computer for crystal structure analyses, utilizing X-ray diffraction data, is the subject of a two-year research project being carried on by the Auburn Research Foundation in collaboration with the Department of Physics, Alabama Polytechnic Institute, under contract with the Office of Naval Research. The computer, devised by **R. Pepinsky,** research professor of physics, sums the two-dimensional Fourier series representing the projection on a lattice plane of electron densities in a crystal unit cell, and presents the summation as a pattern on a cathode-ray tube. Some 850 Fourier terms can be added practically instantaneously by the device, and results of alternations of signs of any number of terms are observable just as rapidly.

A contract with the Foundation for X-ray diffraction studies on piezoelectric crystals has been renewed by the Army Signal Corps. This program is based on a grid-controlled, fine-focus X-ray tube, also developed by Prof. Pepinsky, which can be periodically pulsed in synchronism with an oscillating crystal and at any desired phase with the oscillations, thus providing a diffraction stroboscope.

Industrial Laboratories

At the Eastman Kodak Research Laboratories, David L. McAdam has made a new estimate of the number of separate colors the human eye can distinguish in daylight. Dr. MacAdam estimates that there are about 250 distinguishable colors in the spectrum, plus 10,000 distinguishable tints of spectral colors and 7,000 additional colors, like purple, which do not resemble any spectral colors. He pointed out that 17,000 distinct colors of equal brightness are detectable with a precise optical instrument. To this figure, he has added the fact that when large pieces of colored paper are observed with the naked eye, roughly 50 per cent more colors can be distinguished by the eye than by the finest optical means. Under similar favorable conditions, only about 500 distinct shades of gray, ranging from black to white, can be detected. When color is introduced, each shade of gray in the middle range of the scale of about 500 shades between black and white is expanded up to 17,000 times. This means that in the current change-over from black-and-white to color photography, Kodak researchers working for superior reproduction of color in pictures must contend with an increase of from 500 to several million distinguishable differences.

S. B. Penick & Company, in furtherance of its policy of providing the widest possible line of basic materials for the pharmaceutical, wholesale drug, and allied industries in this country and in the export field, has completed arrangements to acquire the New York Quinine & Chemical Works, Inc., which was established in 1885 and manufactures and distributes a broad line of medicinal raw materials. Its headquarters and manufacturing plants are maintained in Brooklyn, and a branch house is located in St. Louis, Missouri. S. B. Penick & Company's present plans call for continuation of the New York Quinine & Chemical Works' business along its established lines.

Interchemical Corporation, through its Biochemical Division, has renewed its annual grant of $25,000 to the Hektoen Institute for Medical Research, Cook County Hospital, Chicago. This grant is for the support of research concerned with intravenous amino acid therapy and with the role of individual amino acids in human metabolism. One of the main objectives of the research program to be pursued is the formulation of an amino acid mixture to be given by vein that will best satisfy physiologic requirements for nitrogen balance.

Robert S. Long, assistant chief chemist, Organic Section, Research Department, Calco Chemical Division, American Cyanamid Company, Bound Brook, New Jersey, has been appointed assistant director of the Organic Section.

Arthur P. Tanberg, from 1921 to 1946 director of the Du Pont Experimental Station in charge of the Chemical Department laboratories and general service facilities of the Station, and since 1946 administrative director of the Department, retired at the end of November. Dr. Tanberg, who began his career with the company as a stenographer in 1910, is being succeeded by **M. M. Brubaker,** former laboratory director at the Station. At the same time **P. L. Salzberg** will take over Dr. Brubaker's former duties. Both of the latter have been with Du Pont for approximately 20 years.

Meetings

George Washington University and the **Carnegie Institution of Washington** were hosts November 13–15 to a group of theoretical physicists who met to discuss the general subject of gravitation and electromagnetism in relation to the general theory of relativity. This conference was the 10th of a series which started in 1934 and which have been held annually except for war years. The purpose of the conference is to promote thinking on, and discussion of, the unsolved problems in theoretical physics. This year's discussions centered on the difficulties inherent in unified field theories, the size of the universe, the proper interpretation of the red shift, and whether there is a correlation between the rotation of celestial bodies and their magnetic fields. Out-of-town participants included: H. W. Babcock, Mt. Wilson Observatory; Gregory Breit, Yale University; Charles Critchfield, University of Minnesota; Richard Feynman, Cornell University; Leopold Infeld, University of Toronto; H. P. Robertson, California Institute of Technology; M. Schwarzchild and John Wheeler, Princeton University; Julian Schwinger, Harvard University; Edward Teller, University of Chicago; Robert Oppenheimer and Herman Weyl, The Institute for Advanced Study, Princeton, New Jersey.

Those attending the Conference on the Use of Radioactive Isotopes in Agricultural Research December 18–20 at Alabama Polytechnic Institute (*Science*, October 24, p. 390) will witness an interesting demonstration by Ralph T. Overman, senior research chemist at Clinton National Laboratory, of how atomic energy affects plants and animals. A rose with an open flower, a bud, and some leaves will be soaked in a solution of

radioactive phosphorus and the radioactivity in various parts of the plant measured. According to Dr. Overman, the bud should be practically the only part to take up the activity. For his animal experiments white rats will be used. With these he will show that radioactive iodine, when injected into the animal, localizes in the neck, and that, following injection of radioactive potassium into the blood of an animal, the potassium finds its way almost exclusively to the red cells. The forthcoming conference represents the first in this country on this topic.

A symposium on "Modern Instrumental Methods of Analysis," sponsored by the Minnesota Section of the American Chemical Society and the Institute of Technology, University of Minnesota, will be held March 22–24, 1948. Further details will be announced when available.

The American Academy of Oral Pathology will hold its second annual meeting February 8 at the Hotel Stevens, Chicago. The speakers will include: Carl Waldron, University of Minnesota; B. O. A. Thomas, Washington University, Seattle; Edward Stafne, Mayo Clinic; Carl A. Schlack, Naval Medical Research Institute; Hamilton B. G. Robinson, Ohio State University; Barnet Levy, Washington University. St. Louis; Irving Glickman, Tufts College Dental School; Henry Goldman, Boston; Lester R. Cahn, Columbia University; Herman Becks, University of California; and Myron Aisenberg, University of Maryland.

The Academy will cooperate with the New England Society of Oral Surgeons and the Seminar of Oral Medicine in sponsoring a new monthly periodical, starting in January and entitled *Journal of Oral Surgery, Oral Medicine, and Oral Pathology*, which will be published by the C. V. Mosby Company, St. Louis, and which will replace the Oral Surgery section of the *American Journal of Orthodontics and Oral Surgery*. Kurt Thoma, president of the Academy, will be editor-in-chief and editor for the New England Society of Oral Surgeons; Herman Becks will be editor for the Seminar of Oral Medicine; and Hamilton Robinson will be editor for the Academy.

A Pan-American Engineering Congress will be held in South America late in 1948 or in 1949, and it is hoped that every country in this hemisphere will participate. At a meeting this fall of the Executive Board of the Engineers Joint Council Committee on International Relations, J. S. Thompson, McGraw-Hill Book Company, was appointed to represent the Council at a planning meeting which was held in Lima, Peru, November 28. Participation in the Congress will be recommended to all constituent societies of the Joint Council, including the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Chemical Engineers. Canadian engineers will be invited to participate through the Engineering Institute of Canada. Bogota, Colombia, has been suggested as the place for the first Congress.

The Florida Academy of Sciences held its 12th annual meeting at the Florida State University, Tallahassee, November 21–22. Seventy-three papers were presented: 24 in biology, 16 in physics, 8 in bacteriology, 13 in the social sciences, and 12 on general topics. Officers elected for the coming year are: George F. Weber, University of Florida, president; G. G. Parker, U. S. Geological Survey, Miami, vice-president; and C. S. Nielson, Florida State University, secretary-treasurer. Elected as chairmen of the various sections were: John J. Davis, biological; A. A. Bless, physical; and Cyril W. Burke, social. Robert B. Campbell continues as the Academy's representative on the AAAS Council.

The Junior Academy of Sciences held a one-day session in connection with that of the senior group. In addition to presenting 7 papers at their own meeting, members attended a number of the section sessions of the senior academy.

Elections

An International Cancer Research Commission was established as an almost autonomous division of the Union Internationale Contre le Cancer at the Fourth International Cancer Research Congress held in St. Louis, September 2–7. The Commission was set up by unanimous vote of representatives of the 39 nations present. Twenty-one other nations, responding to the invitation transmitted by the U. S. Department of State, expressed great interest, and it is expected that the number of member nations in the Commission will soon be increased. Each nation has only one representative on the Commission, and all representatives have equal voting power. Meetings will be held once a year, never consecutively in the same country. The Commission aims to promote international cooperation in cancer research which is defined as all efforts to advance knowledge of cancer by clinical, experimental, and other means. It does not in any way replace the much larger International Cancer Research Congress which will continue to meet in different parts of the world at intervals of about three years. The following Executive Committee of the Commission was elected, each member having an alternate to act for him if necessary: Ignacio Millan (chairman), Avenida Vera Cruz 69, Mexico, D. F., Alternate, F. Leborgne (Uruguay); E. V. Cowdry (U.S.), Alternate, W. U. Gardner (U. S.); V. R. Khanolkar (India), Alternate, Tu-Shan Yung (China); J. H. Maisin (Belgium), Alternate, A. Lacassagne (France); and A. Haddow (England), Alternate, J. Engelbreth-Holm (Denmark).

At the first annual meeting of the Western Society for Clinical Research held in San Francisco November 7–8 a scientific program was presented and officers elected for the coming year. Mayo Soley, San Francisco, is the new president; Myron Prinzmetal, Los Angeles, vice-president; and Helen Martin, Los Angeles, secretary-treasurer. The Council of the Society consists of Paul Aggeler, San Francisco; Norman David, Portland; Daniel Green, Seattle; Hans Hecht, Salt Lake City; John E. Peterson, Los Angeles; and Lowell Rantz, San Francisco.

NRC News

Fellowships in the Medical Sciences, similar to those which have been administered by the Medical Fellowship Board of the NRC since 1922, will again be available for the year 1948–49. These fellowships, supported by grants from the Rockefeller Foundation, are designed to provide opportunities for training and experience in research in all branches of medical science. They are open to citizens of the United States or Canada who pos-

sess an M.D. or a Ph.D. degree and are intended for recent graduates who are not yet professionally established.

In addition to these fellowships, the Medical Fellowship Board administers two groups of research fellowships, made available through a grant from the National Foundation for Infantile Paralysis, Inc. The first group, open to applicants who hold either the Ph.D. or M.D. degree, is intended to provide opportunities for special training and experience in the study of virus diseases. The second group, open only to graduates in medicine who have completed one or more years of hospital experience in clinical surgery and are planning a career in orthopedic surgery, is designed to provide opportunities for training and research in those basic medical sciences which will be of particular value in furthering progress in the field of orthopedic surgery.

A series of fellowships in anesthesiology has been established through a grant from the American Society of Anesthesiologists. These fellowships are offered with a view to fostering a closer union between the clinical practice of anesthesiology and the fundamental disciplines on which anesthesia rests. Applicants must hold the M.D. degree and must have completed one or more years of hospital experience as intern or resident.

The Medical Fellowship Board has also under its jurisdiction a number of fellowships of senior grade in internal medicine (Welch Fellowships), epidemiology, clinical neurology, orthopedic surgery, pediatrics, and virus diseases, for individuals of proven research ability.

Fellows will be appointed at a meeting of the Board early in March 1948. To receive consideration at this meeting, applications must be filed on or before January 1. Appointments may begin on any date determined by the Board.

For further particulars, address the Secretary of the Medical Fellowship Board, National Research Council, 2101 Constitution Avenue, N.W., Washington 25, D. C.

Funds for the Office of Naval Research, created by Public Law 588, signed by the President on August 3, 1946, were appropriated for the pursuit of scientific research having importance to national security. The greater percentage of these funds was designated for the support of basic research in civilian institutions, universities, and industrial laboratories. By the beginning of 1947 over 200 research projects were being supported, some of them being in the Dental Sciences. As more and more dental projects were submitted to ONR, it became evident that a qualified research dentist was necessary as a consultant. The Director of the Medical Sciences Division, ONR, requested such a consultant from the Dental Division, Bureau of Medicine and Surgery, and in February 1946 a naval dental officer qualified in research was ordered, in an additional duty status, to the Medical Sciences Division. On July 7, 1947, a Dental Branch was established within the Division, with this officer acting as head.

A memorandum from the Director of the Medical Sciences Division to the staff assigned 4 per cent of the funds available to the Division to the Dental Branch for the fiscal year 1949. This amount was later revised by the Director to 5 per cent and included the fiscal year 1948.

At present some 14 universities and institutions have submitted proposals for dental research to ONR, and, of these, the following have been recommended for approval: (1) "Dietary and other factors concerned in mouth and tooth deterioration," Cornell University, C. M. McCay, principal investigators; (2) "Use of germ-free animals in the study of dental caries," University of Chicago, J. R. Blayney, director; (3) "Recognition and evaluation of factors influencing microorganisms of the mouth," University of Pennsylvania Dental School, J. L. T. Appleton, principal investigator; (4) "Study of dental casting materials," University of Michigan, Norris O. Taylor, principal investigator; (5) "Hormonal effects on oral hard and soft tissues," Columbia University, E. Ziskin, principal investigator; (6) "Bacteriemias resulting from tooth extraction and scaling," Tufts College, J. P. Lazansky, principal investigator; (7) "Relation of vitamin C in inflammatory conditions of the gingivae," Georgetown University Dental School, W. C. Hess, principal investigator; (8) "Anylotic activity of saliva as related to dental caries," Georgetown University Dental School, W. C. Hess and E. Everett, principal investigators; (9) "Investigation of salivary ammonia and its relation to dental caries and periodontal diseases," Western Reserve University, J. P. Muntz, director; (10) "Influences of dietary protein on dental caries," Massachusetts State College, Julian O. Holmes, principal investigator; (11) "Determination of masticatory efficiency," Tufts College Dental School, J. T. O'Rourke and R. S. Manly, principal investigators.

For further information concerning the dental program communications may be addressed to the Office of Naval Research, Navy Department, Washington, D. C.

In pursuance of the provisions of the "Plenary Powers" Resolution adopted by the International Congress of Zoology at Monaco in March 1913, notice is hereby given that the International Commission on Zoological Nomenclature has received the undermentioned applications for the suspension of the *Règles Internationales* on the ground that their strict application would clearly result in greater confusion than uniformity:

(1) **Class Nematoda:** to validate the use of *Stephanurus* Diesing, 1839 (type *S. dentatus* Diesing, 1839) (188).

(2) **Class Insecta, Order Collembola:** to validate the undermentioned generic names and to designate as types the species noted in parentheses: *Podura* Linnaeus, 1758 (*P. aquatica* Linnaeus, 1758). *Tomocerus* Nicolet, 1842 (*Macrotoma minor* Lubbock, 1862) (199); *Hypogastrura* Bourlet, 1839 (*Achorutes viaticus* Tullberg, 1872); *Noanura* MacGillivray, 1893) (*Achorutes muscorum* Templeton, 1835) (303); *Anurophorus* Nicolet, 1842 (*A. laricis* Nicolet, 1842) (304); *Dicyrtoma* Bourlet, 1842 (*Sminthurus fuscus* Lucas, 1842); *Dicyrtomina* Borner, 1903 (*Podura minuta* Fabricius, 1783) (305).

(3) **Class Insecta, Order Lepidoptera:** to determine the correct specific name of the species commonly known as "*Argynnis adippe*" Linnaeus, 1761 (79); to determine the identity of *Papilio podalirius* Linnaeus, 1758 (183) and *Papilio iris* Linnaeus, 1758 (184); to validate *Papilio aristolochiae* Fabricius, 1775 (186); to suppress the name *Papilio ajax* Linnaeus, 1758 (192); to validate *Porina* Walker, 1856, and to suppress *Porina* d'Orbigny, 1853 (Phylum Mollusca) (194).

(4) **Class Insecta, Order Hemiptera:** to validate *Lachinus* Burmeister, 1839 (type *Aphis roboris* Linnaeus, 1758) and *Cinara* Curtis, 1835 (type *Aphis pini*

Linnaeus, 1758) (174); to validate *Nysius* Dallas, 1852 (type *Lygaeus thymi* Wolff, 1854) (181) and *Fulgora* Linnaeus, 1767 (type *Cicada laternaria* Linnaeus, 1758) (162).

(5) **Class Insecta, Order Coleoptera:** to validate *Rhantus* Stephens, 1835 (type *Colymbetes pulverosus* Stephens, 1838) (171); *Rhina* Latreille [1802–03] (type *Curculio barbirostois* Fabricius, 1775) and *Rhina barbicornis* Latreille, 1804 (202).

(6) **Class Insecta, Order Diptera:** to determine the correct specific trivial name of the "Buffalo Fly" (195); to suppress certain of the generic names proposed by Meigen, 1800, *Nouvelle Classification* (191); to validate *Chlorops* Meigen, 1803 (type *Musca pumilionis* Bjerkander, 1778) (197); *Calliphora* Robineau-Desboidy, 1830 (type *Musca vomitoria* Linnaeus, 1758) (201); and, if necessary, the emendation to *Phlebotomus* of Flebotomus Rondani, 1840 (169).

(7) **Phylum Protozoa:** to determine the relation between *Endamaeba* and *Entamoeba* (reference Opinion 99) (185).

(8) **Phylum Mollusca:** to validate *Aplysia* Linnaeus, 1767 (type *A. depilans* Linnaeus, 1767) and *Tethys* Linnaeus, 1767 (type *T. leporina* Linnaeus, 1767) (22); to designate *Venus verrucosa* Linnaeus, 1758 as the type of *Venus* Linnaeus, 1758 (189) and *Bulla ampulla* Linnaeus, 1758 as the type of *Bulla* Linnaeus, 1758 (190).

(9) **Class Bryozoa:** to validate *Fenestella* Lonsdale, 1839 (type *F. fenestella* Lonsdale, 1839) (154).

(10) **Class Echinoidea:** to validate the use of *Echinocyamus* van Phelsum, 1774 and *Fibularia* Lamarck, 1816 (prior to Lambert 1891) (318); to designate as types of the following genera the species noted in parentheses: *Spatangus* Gray, 1825 (*S. purpureus* Müller, 1788); *Ova* Gray, 1825 (*S. canaliferus* Lamarck 1826); *Echinocardium* Gray, 1825 (*E. cordatus* Pennant, 1777); *Schizaster* L. Agassiz 1836 (*S. studeri* L. Agassiz, 1843); *Moira* A. Agassiz, 1872 (*Spatangus atropes* Lamarck, 1816); and *Brissus* Gray, 1825 (*Spatangus brissus var unie coloreske*, 1778) (317); also *Phyllacanthus* Brandt, 1835 (*P. dubius* Brandt, 1835) and *Strongylocentrotus* Brandt, 1835 (*Echinus drøbachiensis* O. Fr. Müller, 1776) (319); to validate *Archaeocidaris* M'Coy, 1844 (type *Cidaris Urii* Flemming, 1828) (320).

(11) **Class Bivalvia:** to designate *Mytilus edulis* Linnaeus, 1758 as the type of *Mytilus* Linnaeus, 1758 (193).

(12) **Class Gastropoda:** to fix *Pleurocera acuta* Rafinesque, 1831 as the type of *Pleurocera* Rafinesque, 1818 (83).

(13) **Class Pisces:** to validate *Echeneis* Linnaeus, 1758 (type *E. naucrates* Linnaeus, 1758) (156).

(14) **Class Aves:** to determine the type of *Colymbus* Linnaeus, 1758 (78).

(15) **Suppression of books:** to suppress Zimmermann 1777, *Zoologiae geographiacae* for nomenclatorial purposes (182); to suppress the new names of birds and mammals in the recently discovered pamphlet known as the "Hildesheim List," published about 1840 (196).

Zoologists wishing to comment on any of the above applications are particularly requested, when communicating with the Commission, to quote the file number which appears in parentheses at the end of each entry in the foregoing list. Full particulars in regard to all the above items will be published in the *Bulletin of Zoological Nomenclature*. All communications in regard to the above cases should be addressed to the Secretary to the International Commission on Zoological Nomenclature, Francis Hemming, 83 Fellows Road (Garden Flat), London, N.W. 3, England.

A new British journal of science called *Research* appeared in October and will be issued monthly at a subscription rate of $10 per year. The Scientific Advisory Board is headed by Sir John Anderson and includes as members: Sir Wallace Akers, director of research, I. C. I., and formerly director of atomic energy research, Department of Scientific and Industrial Research; Sir Charles Darwin, director, National Physical Laboratory, Department of Scientific and Industrial Research; Sir Alfred Egerton, professor of chemical technology, Imperial College of Science and Technology; Sir Alexander Fleming, professor of bacteriology, University of London; R. S. Hutton (secretary), formerly professor of metallurgy, University of Cambridge; and Sir Edward Salisbury, director of Royal Botanic Gardens, Kew. Paul Rosbaud is editor, and D. R. Rexworthy is deputy editor. The journal covers the wide field of general scientific research and the application of that research work in the general development of industry. The journal was suggested by a group of British scientists to help fill the gap left by the postwar lack of German scientific publications. The American agent for *Research* is Interscience Publishers, Inc., 215 Fourth Avenue, New York 3, New York.

A Metropolitan Long Island Group of the New York Section of the American Chemical Society, comprising chemists and chemical engineers of Brooklyn, Queens, and Long Island, has recently been established. The group was originally organized in 1945 as the Metropolitan Long Island Chemical Association to meet a need created by the area's rapidly growing importance as a center of chemical industry and chemical education. Officers elected for the group are: Harold A. Horan, St. John's University, chairman; Joseph Mattiello, Hilo Varnish Corporation, chairman-elect; Walter I. Smith, New York Quinine & Chemical Works, treasurer; and Emmet S. Carmichael, Socony-Vacuum Oil Company, secretary. Named to the Board of Directors were: R. B. Killingsworth, Socony-Vacuum Oil Company; Samuel W. Gordon, Endo Products, Inc.; A. J. Nydick, patent attorney; and Bernard L. Oser, Food Research Laboratories, Inc.

The British Medical Association has appointed Grune & Stratton, Inc., Medical Publishers, 381 Fourth Avenue, New York 16, New York, as sole U. S. agents for all the Association's periodical publications. The journals include: *British Medical Journal*, published weekly, $14 per year; *Abstracts of World Medicine*, published monthly, $13 per year; and *Abstracts of World Surgery, Obstetrics and Gynecology*, published monthly, $9 per year. Quarterly journals, with uniform subscription rates of $5.50 per year, are: *Annals of the Rheumatic Diseases*; *Archives of Disease in Childhood*; *British Heart Journal*; *British Journal of Industrial Medicine*; *British Journal of Pharmacology and Chemotherapy*; *British Journal of Social Medicine*; *British Journal of Venereal Diseases*; *Journal of Clinical Pathology*; *Journal of Neurology, Neurosurgery, and Psychiatry*; and *Thorax*.

A significant collection of prehistoric sea shells, now at the American Museum of Natural History, was recently uncovered during a three-month expedition to the Peruvian Andes sponsored jointly by the Museum and Columbia

University and directed by **Norman D. Newell,** professor of geology, Columbia University, and curator of Historical Geology and Fossil Invertebrates at the Museum. The purpose of the expedition was to gain information concerning the geologic formations buried deep under the Amazon jungles. Because the same strata underlying the nearly impenetrable jungles come to the surface in the Andes, where it is possible to examine and evaluate oil-bearing types of rock, the expedition centered on the Andes mountain tops between the elevations of 10,000 and 16,000 feet. The discovery of the colorful marine fossils, between 200,000,000 and 300,000,000 years old, adds proof that this mountain range once lay under a shallow sea—probably the same sea that covered Texas and Oklahoma. The research of the expedition will greatly contribute to the knowledge of one of the world's last great untapped oil reserves in the Upper Amazon Basin.

Interest in the formation of a Public Health Biology Section of the American Public Health Association has been expressed by individuals whose major fields of interest and activity involve the application of biological knowledge and technique to public health practice. These fields include medical or public health entomology, parasitology, mammalogy, limnology, ichthyology, malacology, herpetology, mycology, allergenic botany, and doubtless other related specialties. Existing Association Sections—mainly Laboratory, Epidemiology, and Engineering—provide proper affiliation for certain of the APHA biologists, and it is not proposed that any of these currently satisfactory relations be disturbed. Other biologists with investigational or operational concerns find themselves in the Unaffiliated Section for lack of an Association category indicative of their professional interest. It is believed that some public health biologists have failed to join the American Public Health Association because there appears to be no specific place for them within the existing compartmentalization of the society.

A petition for the formation of such a Section in the Southern Branch of the APHA has already been sent to the Governing Council of that organization. It seems desirable, however, to measure interest in the activation of a comparable Section on a national basis to provide the opportunity at the annual meetings of the APHA for the presentation of more detailed papers and technical discussion of mutual problems in public health biology than might be undertaken in the general sessions of the Association.

As a preliminary step in this direction, it is requested that those interested in the formation of a Public Health Biology Section in the APHA indicate their approval of such a plan and their willingness to cooperate in its activation by writing to Justin M. Andrews, Communicable Disease Center, U. S. Public Health Service, Atlanta, Georgia.

A series of river basin surveys in areas soon to be flooded by the building of dams is currently being undertaken by the Smithsonian Institution in cooperation with the Bureau of Reclamation, National Park Service, and the Corps of Engineers, U. S. Army. Director of the entire project is Frank H. H. Roberts, Jr., associate chief of the Institution's Bureau of American Ethnology.

This past summer more than 500 archaeological sites were found in the Missouri basin alone. These contained evidence of Indian villages, forts, burial mounds, etc. Most productive from the archaeological standpoint were the Fort Randall Reservoir area in South Dakota, where 93 such sites were recorded; the Garrison Reservoir area in North Dakota, in which 55 individual sites were recorded; and areas in Wyoming and Montana, location of some 200 sites. Waldo R. Wedel, of the U. S. National Museum, who was in charge of the field work, indicates in his report that the South Dakota sites cover a period of at least 1,000 years of human occupancy, while some of those in North Dakota were inhabited before the pottery art was acquired by the Indians. From several of the sites in Wyoming and Montana have come artifacts of the so-called Yuma period, which may have flourished as much as 10,000 years ago.

In the Columbia River basin 120 sites have been found. According to Phillip Drucker, of the Bureau of American Ethnology, who was in charge of surveys in that area, this basin is little known archaeologically. Apparently some of the sites were fishing bivouacs used year after year by the Indians, as evidenced by a succession of deposits of camp debris. Caps of volcanic ash indicate great antiquity, possibly dating back to the closing days of the last ice age.

An attempt will be made to excavate some of the most promising sites in all these areas before flooding makes further work impossible.

The National Registry of Rare Chemicals, 35 West 33rd Street, Chicago, lists the following wanted chemicals: cyclohexadiene monoxide; pregnene-4-triol-17(B),-20-(B)-21-dione-3,11-monoacetate-21; pregnene-4-triol-17(B),-20-(B)-21-dione-3,11-diacetate-20,21; pregnene-4-diol-17,20-one-3-al-21; 17-hydroxy-11-desoxycorticosterone; 3-(α)-acetoxy-11-keto-20-aminopregnane; maltobionic acid; 2-propenylpyridine; 3-methylfuran; 2,4-furandicarboxylic acid; stigmasterol; l-tartaric acid; strontium tetrasulfide hexahydrate; 5-chloropentene-1; 6-chlorohexene-1; 7-chloroheptene-1; embden ester; cyclooctadiene-1,5; cyclobutadibenzene; anthrafurane; benzoxanthene; and coniferin.

The archaeological and paleontological collections of Cyrus N. Ray, president, Texas Archaeological and Paleontological Society, made in Texas during the past 20 years, have been transferred to the ownership of the Museum at Texas Technological College, Lubbock. This collection includes a large number of old Texas human crania and vertebrate and other fossils, in addition to 16,000 stone artifacts, belonging to all Texan prehistorical periods as far back as the Folsom, Clear Fork, and Abilene cultures. This is the largest collection of the Clear Fork Culture in existence, and is the original and the type collection of a culture which was used in the Abilene, Texas, region during about the same period as that of Folsom man.

Make Plans for—

American Astronomical Society, December 28–31, Ohio State University, Columbus.

American Anthropological Association, December 28–31, University of New Mexico, Albuquerque.

American Mathematical Society, December 29–31, University of Georgia, Athens.

Archaeological Institute of America, December 29–31, New Haven, Connecticut.

Geological Society of America, December 29–31, Chateau Laurier, Ottawa, Canada.

TECHNICAL PAPERS

Variants of *Escherichia coli*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* Requiring Streptomycin

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Recently, Miller and Bohnhoff (*2*) reported the isolation of a meningococcus variant which required streptomycin for reproduction *in vivo* and *in vitro*. This variant, called type B, appeared in maximum numbers when streptomycin was present in the medium in concentrations of 60–1,000 μg./ml. It produced a small, pearly-gray colony in the presence of low concentrations (60–100 μg./ml.) of the antibiotic, and a large, slightly yellowish colony with higher concentrations, as compared to the large, yellowish colony of the nonrequiring resistant strain, or type A.

anaerobic conditions. In addition, a small number of streptomycin-resistant organisms similar to the type A meningococcus reported above were noted. These produced a flat, grayish-white, spreading colony and were aerobic, nongranular rods.

The basal synthetic medium used in this work was similar to the one devised by Grossowicz (*1*) except for the exclusion of glucose, sodium thiosulfate, sodium d-glutamate, and thiamine. This basal medium contained only NH_4Cl as a nitrogen source and excluded all carbon-containing compounds, and these organisms could not grow until carbon compounds such as those indicated in Table 1 were added to the basal medium. Growth, which was measured by use of the Evelyn Photoelectric Colorimeter, was thus dependent upon the utilization of these added substances.

As indicated in the table, streptomycin stimulated the growth of all the organisms when glucose was present in the medium. Under similar conditions, only *Ps. aeruginosa* was stimulated when formate was present.

TABLE 1

GROWTH OF STREPTOMYCIN-RESISTANT STRAINS ON VARIOUS MEDIA WITH AND WITHOUT STREPTOMYCIN

1		2			3			4			5		
Medium		B.M. + Na formate			B.M. + glucose			B.M. + glucose + Na d-glutamate			B.M. + glucose + Na d-glutamate NH_4Cl		
Time (hrs.)		24	48	72	24	48	72	24	48	72	24	48	72
Strain	Streptomycin conc.												
E. coli													
Suscept.	0	97	95	96	70	60	52	*			*		
SM	0	91[2]	91[1]	91[3]	78[2]	58[2]	52[2]						
SM	250 μg./ml.	91[2]	91[3]	91[1]	66[3]	56	52[3]						
Ps. aeruginosa													
Suscept.	0	92	83	83	91	71	39	*			*		
SM	0	95	84	84	86[2]	53	30						
SM	500 μg /ml.	74	70	73	73[2]	43	36						
B. subtilis													
Suscept.	0	100	100	100	98	98	98	94	95	95	100	98[2]	96[1]
SM	0	100	100	100	97	97	94	92	94	95	99[2]	96	93[2]
SM	300 μg./ml.	97	97	97	75[3]	85	88	77[2]	75[2]	77[2]	79[2]	81[1]	83

Suscept. = susceptible strain; SM = streptomycin-resistant strain; B.M. = basal medium. * These organisms were not grown in these media.

We have recently made a similar observation in our laboratory. Strains of *E. coli*, *Ps. aeruginosa*, and *B. subtilis* that had developed resistance to streptomycin when grown on synthetic media yielded better and more rapid growth in the presence of the antibiotic. The variant strains had developed a resistance to 1,000, 8,000, and 1,000 μg./ml. of streptomycin, respectively, while growing on synthetic media.

A variant of *B. subtilis* was isolated which, on nutrient agar plates containing 150 and 300 μg./ml. of streptomycin, produced a grayish-translucent, spreading growth. This strain, which consisted of granular, rod-shaped organisms, grew only when streptomycin was present in the medium and only under

The growth of the *B. subtilis* strain in the presence of streptomycin and glucose reached its maximum level within 24 hours. However, when an additional carbon and nitrogen source was provided in the form of sodium d-glutamate, growth of *B. subtilis* was maintained for the entire period of observation at the maximum level it had attained with the glucose alone. The removal of some of the available nitrogen by the elimination of the NH_4Cl caused a slight decrease in that level. There was little or no growth of nonrequiring or susceptible organisms in any of the media used.

These results might be explained on the assumption that the *E. coli* and *Ps. aeruginosa* variants consisted of a mixture

of resistant and streptomycin-requiring strains, while the *B. subtilis* streptomycin strain consisted almost completely of a population requiring this antibiotic.

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Seasonal Variation in the Gonadotropic Potency of Dried Anterior Pituitaries of *Rana pipiens*[1]

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It is well known that the injection of anterior lobes of fresh pituitary glands may induce ovulation in a variety of animals. Among amphibia, Rugh (*3*, *4*, *5*) has shown that the gonad-stimulating potency is retained by the gland temporarily when preserved in distilled water and lower concentrations of alcohol, and may be maintained indefinitely when kept in 100 per cent alcohol.

TABLE 1

Comparative Doses for Fresh and Dried Female Anterior Pituitaries Required to Induce at Least 50 Per Cent Ovulation

	November	January	March
Rugh ('41) (fresh glands)	5	4	3
Hamburger ('42) (fresh glands)	5–6	3–5	2–3
Present data (dried glands)	4–7	4	2–3

In order to prevent loss of potency by injection in aqueous solution as well as contamination by traces of alcohol, a simple drying technique was devised by which anterior lobes of glands (*Rana pipiens*) were oven-dried at 94° C. for 48 hours and stored in desiccators until injected. A preliminary experiment conducted on 6 nonbreeding frogs collected in Wisconsin in November demonstrated that as few as 4 dried anterior pituitaries (from female donors) will induce ovulation, although as many as 7 or more may be needed on some frogs. Subsequent tests in January (25 frogs injected) and March (17 frogs injected) showed dried anterior pituitaries to be as effective as fresh glands in inducing ovulation, as determined by both the stripping method and direct observation of the ovaries. The effective doses for dried glands are compared with those given by Rugh (*7*) and Hamburger (*1*) for fresh glands, female donors being used in all cases (Table 1). As far as we are aware, there is no report in the literature concerning either the use of, or the doses necessary for, dried glands to induce ovulation in frogs. Rugh, however, states in a personal communication that the method has been used successfully in his laboratory.

The technique involving injection of dried anterior lobes has been applied to the problem of the determination of the relative gonadotropic potency of pituitary glands compared with the relative responsiveness of the gonad during various seasons of the year. The work of Rugh (*4*, *5*, *6*) indicates that the pituitary of the donor, as well as the gland of the recipient, may undergo seasonal changes. However, the variations in the gonadotropic activity of both are confused by seasonal changes in the responsiveness of the gonad. In some animals clear-cut seasonal changes in gonadotropic potency of the pituitary have been shown, as, for example, in the 13-lined ground squirrel, *Citellus tridecemlineatus*. Moore, *et al.* (*2*) were able to detect no gonad-stimulating hormone in the sexually inactive animals, but they found considerable gonadotropic substances on the approach of the reproductive season.

Glands removed from freshly caught frogs (*R. pipiens*) and dried in mid-January were compared in ovulation-inducing capacity with glands removed and dried in mid-March. The recipients, females in the prebreeding condition, were injected during the last week of March. All recipients, furthermore, were tested for ovulation by stripping and shown to be negative prior to injection. Control frogs did not ovulate throughout the duration of the experiment, terminated the last of April. Whereas an average of 4 January glands were necessary to cause at least 50 per cent ovulation (within one week after injection), 1–3 March glands induced ovulation in frogs in the same stage of breeding activity (Table 2). Although the number of experimental animals used was necessarily small, there is clearly a marked decrease in the number of donor glands required to induce ovulation between January and March. As all injections were made into March frogs, of comparable body length and breeding activity, it seems evident that the seasonal change is to be attributed primarily to ovulation-inducing capacity of the pituitary rather than to a change in the responsiveness of the gonad.

TABLE 2

Ovulation-inducing Capacity of Dried Female Anterior Pituitaries From January and March Frogs Tested by Response of March Frogs

Gland source by date	No. glands per frog	No. frogs injected	No. showing at least 50% ovulation	% showing at least 50% ovulation
January	2	9	0	0
	3	10	3	30
	4	6	4	66
March	1	6	4	66
	2	6	4	66
	3	5	5	100

From these observations it is concluded that (1) desiccation does not alter the potency of the anterior pituitary, and (2) the gland undergoes seasonal variation increasing in gonadotropic potency between January and March.

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[1] We are indebted to Dr. Roberts Rugh of New York University for suggestions in the preparation of this manuscript.

[2] Now at the University of Illinois, Department of Zoology.

Rate of Disappearance From Plasma of Intravenously Administered Methionine in Patients With Liver Damage[1]

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In a previous paper (*2*) it was reported that following the intravenous administration of 1.5 gram of DL-methionine to normal male subjects, a predictable disappearance of the L isomer occurred over a 2½-hour interval.

It was postulated that protein metabolism in patients with liver disease might be sufficiently impaired to decrease significantly the rate of disappearance of the L isomer from the plasma, and that if such proved to be the case, the rate of removal might be construed as the rate of utilization, *i.e.* anabolism or catabolism, exclusive of diffusion or storage.

organism *Leuconostoc mesenteroides* P-60, which detects only the L isomer (*1*). In the majority of cases here reported, assays were simultaneously performed with *Lactobacillus fermenti* 36, which utilizes both D and L isomers (*1*). Urinary methionine was determined on an aliquot of a sample collected over the 12 hours preceding the test, for the 3-hour period during the test, and for the 43 hours after its completion. For the 24-hour period immediately preceding and the 48-hour period following the test, the dietary intake of methionine was maintained at an essentially constant level.

The findings in all controls and in the first 13 patients with liver damage studied are presented in this preliminary report. The rate of disappearance per hour over the 30–180-minute period has been adopted as the index of methionine utilization. All these data, together with other "liver function" values for comparative purposes, are presented in Fig. 1. Study of this graph reveals the following:

(a) With the exception of one high value, the rate of removal in the control subjects varies from 330 to 540 μg./hour with a mean of 410. Additional data obtained since completion of this diagram both in controls and in completely well posthepatitis patients, confirm this range and mean.

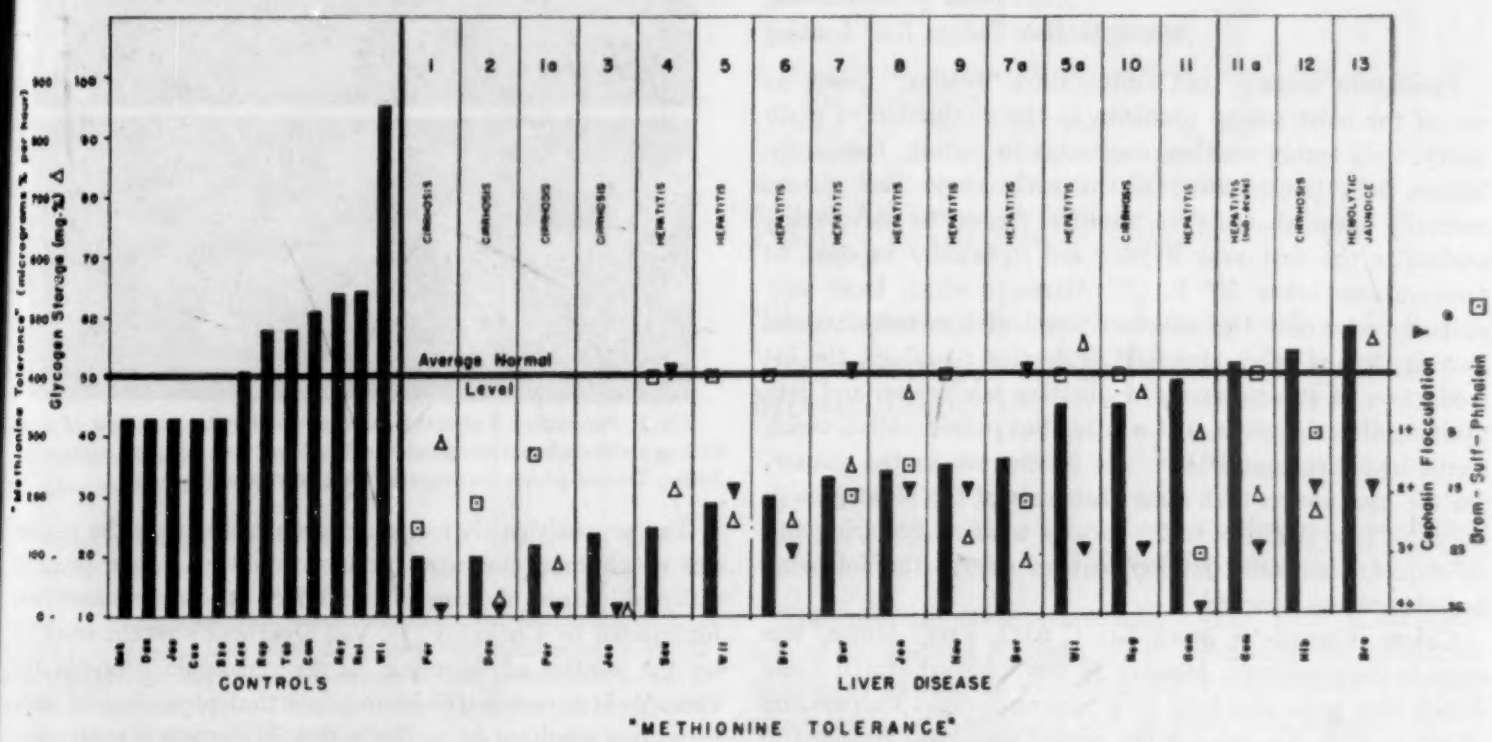

FIG. 1. Columns represent rate of disappearance of plasma methionine in micrograms per cent per hour.
1 and 1a—Values in the same cirrhotic at a 6-week interval—note constancy of all findings. Clinical status unchanged.
7 and 7a—Acute hepatitis patient, 2-week interval; still active hepatitis. A third value obtained 2 weeks later was within normal limits (340 μg./hour)
5 and 5a—Acute hepatitis, 3-week interval—note correlation with glycogen storage index.
11 and 11a—Patient with subacute hepatitis, 12-week interval; considerable fibrosis and round cell infiltration in biopsy specimen.

The same technics were used in the individuals with liver damage as in the normal controls (*2*). These procedures consisted, in brief, of administering 50 cc. of 3 per cent DL-methionine intravenously over a 5-minute period and then determining the plasma L-methionine values at 0 (fasting, premethionine), 15, 30, 60, 120, and 180 minutes postmethionine.

Microbiologic assays for methionine on both blood and urine were carried out as previously described (*2*), using as a test

(b) With rare exceptions, patients with acute or chronic liver damage show a significant decrease in the rate of removal of the administered methionine.

(c) Hepatitis patients progress from abnormal to normal values during convalescence.

The data on urinary excretion of L- and DL-methionine, and on blood levels of D (DL- minus L-)-methionine will be considered in detail in a later paper. On the basis of data so far obtained one may, however, make the following statements:

(a) Urinary excretion of L-methionine in normal individuals and in patients with liver damage is minimal, in no instance exceeding 6 mg. during the 3-hour postinjection period.

[1] This work has been performed under a grant from the Office of Naval Research.

The methionine used in this study has been supplied through the courtesy of the Wyeth Company.

(b) D-methionine, on the other hand, is excreted rapidly, during and following the intravenous administration of the DL-preparation, up to 35 per cent of the administered dose being excreted during the 3-hour test period. This is of obvious importance in a consideration of the net retention of an administered dose of the DL compound. The blood levels show a higher initial peak than in the case of the natural isomer with a more rapid rate of disappearance, which is at least in part referable to rapid excretion.

It is thus concluded that the rate of removal of intravenously administered L-methionine serves as an index of liver function.

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A Chemical Control of Seedstalk Development in Celery[1]

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Premature seeding, commonly called "bolting," poses as one of the most serious problems in the production of early celery. Cold spring weather, conducive to bolting, frequently follows field transplanting of the early crop. The plants, normally biennial, react as annuals, frequently developing seedstalks the first year if they are repeatedly exposed to temperatures below 50° F. (*2*). Attempts which have only partially overcome the adverse effects of low temperatures include the use of various field protective coverings, the introduction of strains having nonbolting tendencies, and late planting after danger of cold weather has passed—all of which result in either considerable loss or expense to the grower. On the assumption that some chemicals of the plant growth hormone type might have the faculty to affect flowering and subsequent seedstalk development in celery, the following experiment was designed.

Celery (Cornell 19, Stock No. C 6313, Ferry Morse) was sown in the greenhouse January 28, transplanted March 5 into 3-inch clay pots, and held at a minimum night temperature of 60 ± 1° F. On April 4 the potted seedlings, arranged in groups of 20, were sprayed with various concentrations of several growth-regulating substances. Ten treatments and a control were compared. Water sprays of the various chemicals were applied by means of small household sprayers, care being taken to insure complete coverage of all aerial plant parts. Thirty-six hours following spraying, one-half of each group was removed to a cold frame, where the plants were exposed to minimum night temperatures of 41 ± 2° F. The other half remained in the greenhouse at the night temperature of 60° F. On May 26, both lots were transplanted into the open in muck soil as two randomized replications for each of the two temperature treatments. The four blocks were adjacent, and each plot contained 5 plants.

Seedstalk development was evident after one month on control plants which received the cold frame exposure. By July 13, two and one-half weeks later, 80 per cent of the plants had bolted. Seeding was 100 per cent by August 21, and mature seed was present on the same plants September 1. In sharp contrast, celery plants sprayed with 100 ppm of α-o-chlorophenoxypropionic acid (*4*) showed no evidence of seedstalk development throughout the experiment. All plants so treated remained strictly vegetative and attained a marketable size (Fig. 1).

Similarly, seeding on the control celery plants from the warm greenhouse occurred by August 20, and on September 30, 80 per cent had bolted. Again, without exception, those plants which had received the spray of α-o-chlorophenoxypropionic acid, yet otherwise identically treated, remained vegetative.

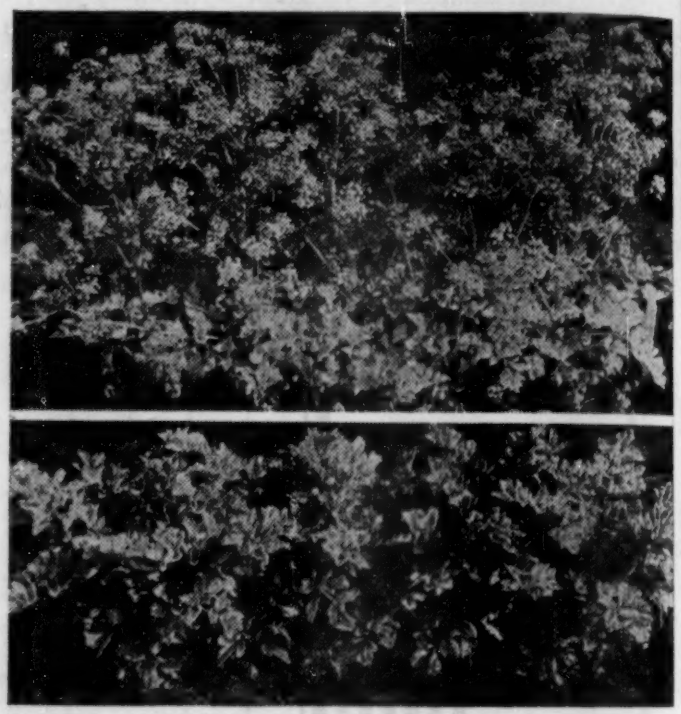

FIG. 1. Prevention of premature seeding of celery by treatment of plants with α-o-chlorophenoxypropionic acid. *Above*: Controls (no treatment). *Below*: Treated plants four months after treatment.

The supposition that organic chemicals having the properties of phytohormones might be introduced into a plant at different stages of growth and affect its development was formulated by Cholodny (*1*). Van Overbeek's recent work (*3*) on the control of flowering in the pineapple supports this concept. It is now a well-known fact that physiological manifestations resulting from the action of growth regulators on plants are dependent on concentration as well as on qualitative differences in the various chemicals. We have assembled evidence demonstrating that, for a given plant, the same substance may accelerate or retard flowering, as the case might be, depending on the concentration used. Our data strongly suggest possibilities in controlling seedstalk development (flowering ?) in certain vegetable crops by applying hormone-like chemicals before the temperature-induction of flowering occurs. A continuance of these studies with the many practical ramifications as objectives should be fruitful in providing a key to some of the causal factors in the flowering process in higher plants.

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[1] Journal Article No. 913 (n.s.) from the Michigan Agricultural Experiment Station.

s the Action of Calcium in the Coagulation of Blood Stoichiometric or Catalytic?[1]

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By determining the amount of thrombin formed from known quantities of calcium, one is able to conclude whether the action of the latter is catalytic or stoichiometric. A simple method to control accurately the concentration of calcium is to add known amounts to plasma obtained from blood decalcified by passage through Amberlite[2] according to the procedure recently described (*4*). Thrombin may be satisfactorily estimated by allowing a plasma to clot and then (after the thrombin has been inactivated by the normal antithrombin of the plasma) determining the amount of prothrombin remaining.

TABLE 1

QUANTITATIVE RELATIONSHIP BETWEEN PROTHROMBIN ACTIVATION AND THE CALCIUM CONCENTRATION IN HUMAN PLASMA

Mixture	(cc.)	Clotting time of mixture (sec.)	Prothrombin remaining in serum after 1 hr. incubation	
			Time* (sec.)	Per cent of normal (approximate)
Amberlite plasma	0.4			
1 Thromboplastin	0.1	90	11	100
Calcium chloride, 0.0006 M	0.1			
Amberlite plasma	0.4			
2 Thromboplastin	0.1	13½	35	10
Calcium chloride, 0.0025 M	0.1			
Amberlite plasma	0.4			
3 Thromboplastin	0.1	12½	105	2
Calcium chloride, 0.005 M	0.1			

*To 0.1 cc. of serum were added 0.1 cc. of thromboplastin, 0.1 cc. of 0.02 M calcium chloride, and 0.1 cc. of fibrinogen or fresh human plasma treated with tricalcium phosphate. The preparation of reagents and the general procedure have been described previously (*2*).

The results summarized in Table 1 clearly suggest that the relation of calcium concentration to thrombin production is stoichiometric. When the calcium chloride concentration in plasma is 0.00015 M (Mixture 1) or lower, very little prothrombin is changed to thrombin in one hour, even though other conditions, including an excess of thromboplastin, are optimum. The thrombin formed, although very small in amount, coagulates all the fibrinogen because it acts enzymatically. Were the action of calcium catalytic, it would similarly convert all the prothrombin to thrombin. It is only when the calcium concentration of plasma is 0.0012 M (Mixture 3) that nearly all of the prothrombin is consumed or converted.

[1] This research was supported by a grant from the U. S. Public Health Service.

[2] Amberlite IR 100 is a phenol-formaldehyde resin which functions as a cation exchanger.

These findings supply another link in the chain of evidence that the reaction or reactions that bring about the production of thrombin from the prothrombin complex, thromboplastin and calcium, are chemical and not enzymatic. That thromboplastin acts stoichiometrically was indicated by the work of Mertz, Seegers, and Smith (*1*) and recently confirmed by the writer working with hemophilic blood (*5*).

Calcium is closely associated with prothrombin, but the solution of this relationship is contingent upon a fuller understanding of the composition of prothrombin. The concept of the writer (*3*) that it is a complex and not a unitary substance has recently found clinical confirmation (*6*). The writer has studied one family in which three members have a congenitally reduced concentration of one of the components, designated as "B", and recently he has discovered another family in which two brothers have a congenital lowered level of a second principle, which has been named component A. Much study will be required before one can determine how these factors interact, but from available data it appears fairly certain that the reactions follow the law of mass action, and that none of these factors can be considered accelerators or activators in an enzymatic or catalytic sense.

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The Action of the Endotoxin of *Trypanosoma cruzi* (KR) on Malignant Mouse Tumors[1]

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This communication is essentially a verification of the findings of Roskin and Kluyeva (*2*) in producing the substance designated as KR, an extract of the lysed cells of *T. cruzi*, which has a lytic effect on certain malignant tumors.

A culture of *T. cruzi* was obtained which originated from authentic cases of Chagas' disease.[2] Following the Russian prescription, this was allowed to grow on a sterile medium containing rabbit blood at a temperature of 22–24° C. In a period of 14–19 days large colonies of organisms were obtained.

Only minor changes were made in the original Russian procedures in preparing the extract of the endotoxin. Lysis was accomplished by covering with pyrogen-free distilled water and allowing to stand at refrigerator temperatures overnight. Metaphen at a final concentration of 1:10,000 was used to ensure additional protection against bacterial contamination.

[1] Presented at the Fourth International Cancer Research Congress, September 2–7, 1947, St. Louis, Missouri.

[2] Grateful acknowledgment is made to J. A. Aeschlimann and R. Schnitzer, of Hoffman-La Roche, Inc., Nutley, New Jersey, and to Malcolm Soule, University of Michigan, for cultures designated as 2 and 3. (When the two cultures were combined in one, the designation is 23. Culture 3 was used in practically all our work, unmixed with 2.)

The lysed material was designated and was rated in terms of the number of lysed organisms per milliliter, as determined by counts before lysing. One KR unit is the lysed product of 1,000,000 organisms.[3]

Careful technique is required in the procedure, because *T. cruzi* is very sensitive to temperature, nutrient base, and other variables. Lysis is easily produced, and any inadvertent departure from set conditions might result in a high mortality of the organisms before the proper separations can be made. In addition, a variation in strain might lead to entirely inactive extracts, as reported by T. Hauschka and associates (*1*).

Two kinds of well-established malignant tumors in mice were tried: (a) spontaneous mammary carcinoma and (b) sarcoma 180. Injections of 1 KR unit were made throughout the experiments, unless otherwise noted, as in the toxicity tests. They were made daily, a day being skipped occasionally, as on Sundays. In some cases the animals were used for ass purposes on materials which proved to be inactive, and co sequently the treatment with active material was thus delay or protracted.

Complete observations were made as to the initial conditio of the cancers, effects in the gross during treatment, and effec in the gross and in the histology when animals were autopsied with special attention to the tumor site, liver, kidney, heart lungs, etc. Slides were prepared in all cases, unless a particular tissue were autolyzed. Photographic records were taken at frequent intervals.

TABLE 1

EFFECT OF THE ENDOTOXIN OF *T. cruzi* ON MOUSE MALIGNANT TUMORS
(Series A: Spontaneous Mammary Carcinoma)

Mouse	Dates	KR Prep.	No. of injections	Am't tumor left (%)	Histology of organs
Group 1					
1 k	6/16-6/23	61347-23	8	10	Normal
3 k	"	"	8	25	"
6 k	6/16-6/26	"	10	25	"
7 k	"	"	10	20	"
9 k	6/16-6/23	"	8	5	"
11 k	"	"	8	0	"
4 d 7/14	6/16-7/14	"	18	5	"
5 d 7/2	6/16-7/1	"	13	0	"
Group 2					
13 k	6/23-7/22	613	21	0	"
14 k			23	0	"
15 k			12	0	"
18 k accid.			3	50	"
20 k			18	0	"
19 d 7/2			8	80	Autolyzed
Group 3					
21 k	6/30-7/23	627-3	18	0	Normal
23 k			13	0	"
24 k			4	20	"
28 k			21	0	"
32 k			5	65	"
22 d 7/29	2 tumors		14	0	Autolyzed
26 d 7/30			19	10	"
29 d 7/31			16	5	"
30 d 7/3	Very large		3	95	Necrotic liver
33 d 7/29			19	0	Normal
34 d 7/8			5	65	Fatty yellow liver
Group 4					
36 k	7/15-8/14	7104-3	21	0	Normal
40 k			16	0	"
42 k			16	0	"
45 k			19	0	"
38 d 8/14			23	0	"
41 d 7/31			13	5	Autolyzed
46 d 8/3			12	5	"

d = died, k = killed, 0 = no tumor found.

TABLE 2

EFFECT OF THE ENDOTOXIN OF *T. cruzi* ON MOUSE MALIGNANT TUMORS
(Series B: Sarcoma 180)

Mouse	Dates	KR Prep.	No. of injections	Am't tumor left (%)	Histology of organs
52 k 8/14	Start 7/15	7247-3	7	0	Normal
54 k 8/14			7	0	"
57 k 8/14			11	0	"
61 k 8/14			9	0	"
49 d 7/24		710-34A	8	100	Autolyzed
50 d 8/14			10	0	"
51 d 8/3			13	10	"

Mice # 53, 56, 59, 63 still alive 8/28/47 with no visible tumors; injections stopped at 10.

Table 1 is a summary of experiments with a selected group of mice having well-developed, proven, spontaneous mammary carcinoma. Table 2 is a summary of experiments with a selected group of mice having well-developed, proven sarcoma 180.

Figs. 1 and 2 show the appearance of a sarcoma at the start and after complete regression followed by a period of recovery and growth, and the histological evidence of regression under treatment to a completely necrotic condition of the cancer.

The spontaneous mammary carcinoma mice came from a strain in constant use in research, on which numerous controls were tested and showed no spontaneous remissions. The tumors form at about 9 months of age and are well-developed 3–4 weeks later, at which stage they were used in the experimental work. In the controls the mortality is nearly 100 per cent in 2 months. The sarcoma 180 mice were chosen at an advanced stage of tumor development, namely, at 2.5 weeks, when the life expectancy shown by numerous controls was 3 weeks. On groups so screened the spontaneous recovery is well below 10 per cent.

Although an effort was made to make all the preparations of KR of the same strength, the biggest factor of uncertainty was the difficulty of making accurate counts of organisms. There must also be hidden variables in the techniques of seeding cultures, small variations in the conditions of growth and harvesting, in the chemical purification, and in the conditions of lysis which affect the potency. That the preparations were not of equal strength is suggested by the fact that the animal responses were not quite proportional to the total dosage. One preparation of KR (Table 1, group 3) showed a high mortality, attributable possibly to inadequate purification.

The character of the regressions can be gauged from the following typical case histories:

Mouse #21: spontaneous mammary carcinoma. Tumor in the left inguinal region, 1 x 1.5 cm. It was firm and infiltrated

[3] Since the results are due to an active ingredient of the KR, calibration will have to be made in terms of its action on standard tumors. It is suggested that the active ingredient of KR be called *trypanosin*.

into the surrounding tissue. Treatment was started on June 30, 1947, and stopped on July 22, a total of 18 injections being given at a uniform dosage of 1 unit/injection. Shrinkage and marked softening of the tumor was apparent after the 4th daily

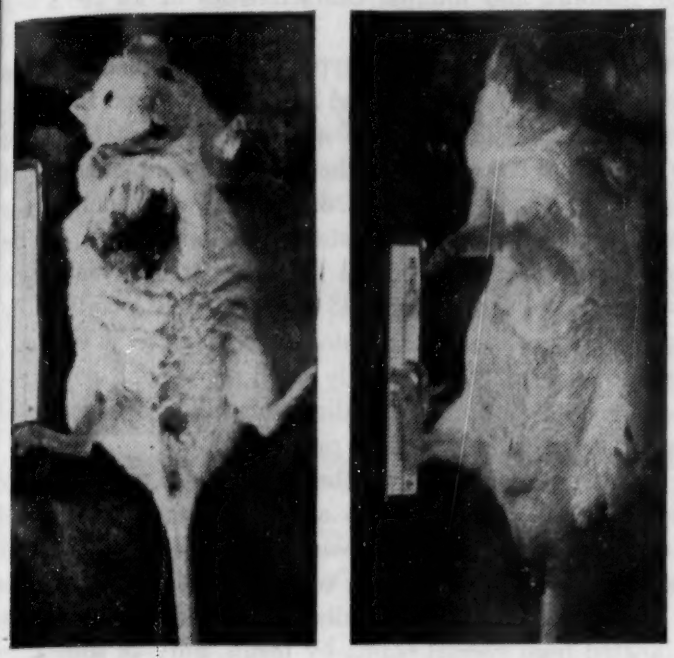

FIG. 1. Regression of sarcoma 180 and recovery thereafter (mouse #54). *Left:* before treatment. *Right:* one month after 7 injections.

injection; after the 7th injection, only a small nodule could be palpated; after the 12th, no tumor at all could be palpated. The animal was killed and autopsied on August 14. No tumor was found. A 2-mm. nodule consisting of fibrous tissue was

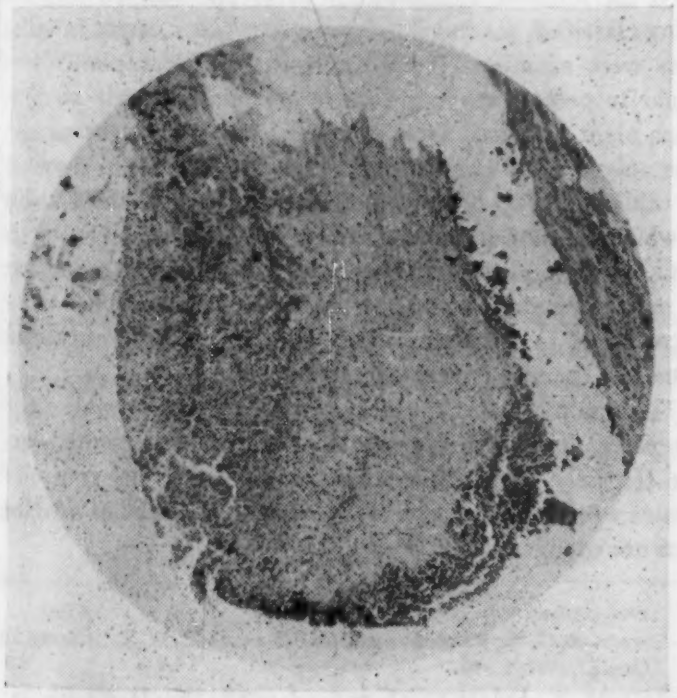

FIG. 2. H and E × 90 photomicrograph showing spontaneous mammary carcinoma completely necrotic after 5 injections with KR (some fibroblastic proliferation present).

present at the original tumor site. All organs were normal under microscopic examination.

Mouse 54: sarcoma 180. The initial tumor was 10 days old, 5.5 cm. in diameter, firm, and partly ulcerated. Injections were started on July 15, 1947, a total of 7 being given in the course of a week. After the 4th injection the tumor became smaller, completely ulcerated, and discharged cheesy material; after the 6th, the tumor was 0.25 cm. in diameter; on the 7th, the tumor was entirely gone, and the original site was completely covered with new epithelium. The mouse was kept alive for 3 weeks after healing, during which time it lost its runted appearance and gained weight. It was then killed and autopsied. No tumor was found. Fibrous tissue was found subcutaneously. All organs were normal in the gross and microscopically.

The KR was also probably of unequal stability because the conditions of preservation at low temperatures differed, as did the time of exposure to the air. The Russian observers claim a period of stability no longer than 10 days. If the same KR was used beyond 10 days, *i.e.* beyond injection 9, there is still some doubt whether the preparation was fully active.

It is apparent that with potent preparations of KR (Table 1, group 2) 10 or more injections on consecutive days can produce 100 per cent remission of tumors with no damage to any organs.

Damage to the liver was noted only in the case of 2 mice, both of which died before any extensive treatment with KR, namely, after the 3rd and 5th injections (mice 30 and 34), and both treated with the same preparation, which was considered impure. Mouse 30 had an exceptionally large tumor at the start. In both cases there was practically no regression, and the consideration comes to mind that possibly both mice had damaged livers to begin with. Otherwise, no organ injury of any kind has been found in 100 animals that have come to autopsy to date.

In Series A (carcinoma) decreases in tumor size were noted in all cases. Complete regression was noted in 25–83 per cent of the cases, depending on the KR preparation used and the number of injections made. In spite of the exploratory nature of the experiments, complete regressions were noted in 55 per cent of the cases, and regressions of better than 50 per cent in over 90 per cent of the cases. Fifteen per cent of the animals were kept alive and have shown no return of the tumors grossly in the course of 1–2 months. This work is being continued.

At the present writing 40 sarcoma 180 mice are undergoing treatment and are healing. Only one group is reported in Table 2, showing complete regression in 9 out of 11 and 1 failure. In 15 controls, untreated by KR, 2 animals showed signs of regression which was sufficiently slow to weed them out from the experiment proper and testing with KR. When regressions occur with KR, the effect is, on the contrary, rapid and clearly connected with the injections. The one complete failure defies explanation at present because of the autolysis of the organs of the animal found some time after death. It must be remembered that we have screened animals for test with active KR when they were as near death as possible.

A set of 14 healthy animals were tested with KR, receiving 4 times the therapeutic dose in a series of 11 injections, and sacrificed. All organs were found normal on autopsy and histological examination.

The experiments are being continued on a larger scale and with a larger variability of the numerous factors that enter into the situation.

Our experiments show that the endotoxin of *T. cruzi* exerts a selective lytic effect on malignant tumors in mice, such as spontaneous mammary carcinoma and sarcoma 180. The

endotoxin is not toxic to normal tissues under the conditions of therapy and in concentrations 4 times as great.

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Male Sterility in the Carrot

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Male sterility has been reported in several crop plants including tomato (*3, 6, 9*), flax (*2*), corn (*4, 8*), onion (*5*), sorghum (*1, 10*), barley (*11*), and sugar beet (*7*), and the possibility of utilizing this character in the production of hybrid seed for commercial planting has been pointed out by several investigators. Present horticultural varieties of carrots lack uniformity when environmental conditions deviate from the optimum. By studying the combining ability of paired inbred lines, one in each combination possessing the male-sterile character, it is theoretically possible to obtain extremely uniform carrot varieties which are also superior to those now available in general appearance, productivity, quality, and nutritional value. The feasibility of using inbred lines of corn in producing seed for commercial planting is due to the monoecism of the plant and the ease in making cross-pollinations. In perfect-flowered plants like the carrot it is impractical to employ inbred lines in this way without male sterility.

An apparently male-sterile carrot plant was found in a collection of several dozen being grown for inbreeding in a greenhouse planting in the winter of 1945–46 at the U. S. Regional Vegetable Breeding Laboratory, Charleston, South Carolina. This plant was grown from a root selected in a commercial stock of the variety Tendersweet in the spring of 1945. Caging of certain umbels took place a day or so before the first flowers normally would open, and the caged umbels were observed daily for the appearance of exserted stamens, the stage at which blowflies are introduced into the cages as pollinating agents. The first flies were placed in the cage on February 25, 1946, even though no stamens were evident. A few days later microscopic examination showed that the anthers of this plant were shriveled and brown in color before any petals unfolded. No exserted stamens were found. On March 9, 1946, an umbel of the variety Nantes Strong Top, grown from a root selected from a commercial stock in the spring of 1945, was placed in a test tube of water and introduced into the cage with the apparently male-sterile plant. This procedure was continued with fresh umbels from the Nantes plant. Later the two entire plants were isolated in a single large cage. The seed on the selectivity caged umbels was harvested separately from the other umbels because some seed had set on the male-sterile plant outside the small cage by open pollination before the whole plants were enclosed. The pollen parents of these seeds were unknown. Female fertility of the male-sterile plant appeared normal.

On September 6, 1946, a portion of the hybrid seed was planted under good conditions. The 67 roots which were produced were harvested on January 6 and 28, 1947, and held at 32°–35° F. until they were planted in the field between February 21 and March 18, 1947, at 5 different locations. The histories and internal characteristics of all roots were recorded.

Classification of the flower types of these F_1 plants between June 6 and July 7, 1947, showed 39 male-sterile and 15 normal. The balance of the plants to make the total of 67 planted either had not flowered when the last notes were taken or were lost before classification. No difficulty was encountered in distinguishing between male-sterile and normal plants. The abnormal specimens appeared like the parental male-sterile plant found in the winter 1945–46 greenhouse planting. The mode of inheritance of the male-sterile character is unknown, because so far only a relatively small segregating population has been studied. Further breeding tests will be required before a genetical explanation can be proposed.

In order to determine whether male-sterile plants produce any self-fertile pollen, umbels of four segregates were caged with blowflies. Three of these plants set a few seeds. If enough plants can be grown from these seeds, proof should be obtained as to whether these were really selfed seeds or were cross-pollinated from normal plants by thrips, ants, or some other very small insects that penetrated the fine-mesh cloth cage covering. Umbels were not allowed to touch the cloth, thus eliminating the possibility of insects outside the cages pollinating enclosed flowers pressed against the inside of the cloth. Isolated plantings of single male-sterile plants and other plantings with several male-sterile plants would give further information on the possibility of viable pollen production.

At the time the F_1 population involving male sterility was being classified, several dozen plants in other carrot breeding lines were examined for flowering habit. Four plants were found to possess varying degrees of apparent male sterility. Each plant produced some exserted stamens, but the number was only a small percentage of those which would normally be exhibited. Two of the specimens shed pollen, the viability of which was not determined, but no pollen production by the remaining two plants was observed. All four set an abundance of open-pollinated seed. This partial male sterility was not encountered in classifying the F_1 population which was segregated for the male-sterile character.

The mode of inheritance in the carrot of the male-sterile character, for which segregation data were presented, and the partially male-sterile types with which no controlled crosses were made will not be known until additional breeding tests are completed.

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IN THE LABORATORY

Solubility of Iron in Submerged Soils

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While studying the water-soluble ions in the Brookston and similar soils from the vicinity of Chatham, Canada, an interesting phenomenon was observed that undoubtedly has a bearing upon the growth of certain crops in some seasons. On August 25, 1947, 24 samples of Brookston silty clay loam soil, A_p and B horizons, were used in the study of the water-soluble

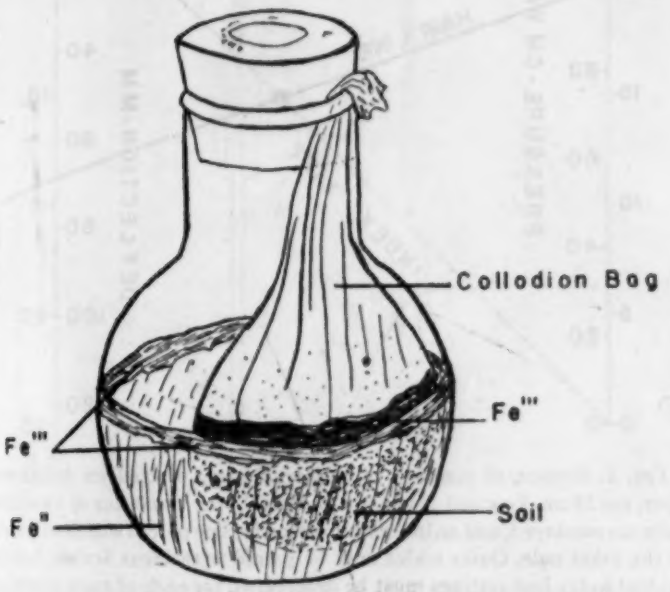

Fig. 1. Dialysis of soil in collodion bags.

ions. The procedure (Fig. 1) consisted of placing 50 grams of soil inside a collodion bag in a 150-ml. extraction flask. Then 50 ml. of distilled water was added to the soil inside the bag, and another 50 ml. was placed on the outside of the bag. The bag was lifted slightly and held in suspension by stoppering the flask.

TABLE 1

WATER-SOLUBLE IRON* IN BROOKSTON CLAY LOAMS

Soil horizon	Ferric iron	Ferrous iron
A_p	12 ± 5	24 ± 9
B	6 ± 1	21 ± 9

* Parts per million in the soil (mean of 24 samples, pH 6.7–7.2).

After the first analyses of the solution outside of the bag were made, the flasks were allowed to remain stoppered tightly, undoubtedly creating anaerobic conditions. After about one week a brown iron stain began to accumulate on the surface of the soil. On September 6, analyses of the water outside of the bag were made for ferrous and ferric iron.

The results in Table 1 show that considerable ferric iron was in solution, and an even larger amount of ferrous iron. Since the top soil had more soluble iron than the subsoil, undoubtedly the breakdown of the organic matter was influencing the solubility of iron. The pH value of the soils was near 7.0. By October 11 all of the ferrous iron had been oxidized to ferric iron, had collected on the flask and bag at the water level, and had precipitated in a gelatinous mass in the bottom of the flask.

Phosphates were not found in solution. Iron phosphates are of low availability to tomatoes (*1*) and other vegetable crops, particularly at a pH value near neutral. In at least two of the last 10 years, phosphorus deficiency on tomatoes has been exceptionally noticeable in the Chatham area in Canada and in the Toledo, Ohio, area. This occurred after a cold, wet spring. It is believed that the above phenomenon offers an explanation of the extreme phosphorus deficiency. In other words, once these heavy soils are packed down and water remains on them for several days, a suboxidation condition similar to that described above is set up. When wet, cold springs occur, early, deep, and thorough cultivation should help to prevent the purpling (phosphorus deficiency) of the tomato crop.

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A Simple Calculator for Certain Types of Instrumental Data[1]

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Employing the nomographic principle of similar triangles, we have produced a simply constructed device which is of considerable value in converting the deflections recorded by optical manometers into their equivalent pressure measurements. Extensions of the underlying principle permit ready application of this apparatus to a number of other types of instrumental data.

In many situations, an instrumental reading, y, bears the following relation to the quantity, x, being measured:

$$y = k \cdot f(x), \qquad (1)$$

k being a proportionality factor. In some instruments, such as optical manometers, k may vary with the age and the con-

[1] The work described in this paper was supported by U. S. Public Health Service Grant No. 101.

ditions of membrane and mirror mounting, and in other types of instruments k may be altered at will.

Graphic representation of the relations between x, y, and k may be obtained as follows: Two parallel scales are constructed. One of them, a linear scale, will be the y scale; the other will be plotted as an f(x) scale. The plots for successive values, y and f(x), are placed to run in opposite directions on the two scales. A proportionality (k) scale may be laid out on a line joining the origins of the y and f(x) scales. If both parallel scales are plotted in identical units of linear measure and b is the distance between the two origins, the proportionalities represented by a point at the distance "a" from the origin of y scale will be

$$k = \frac{a}{b - a}. \qquad (2)$$

Solving Equation 2 for a, the positions of points for a proportionality scale may be computed from

$$a = \frac{kb}{k + 1}. \qquad (3)$$

Inspection of Equation 3 indicates that a full range of proportions from zero to infinity is included in the k scale.

For the sake of compactness and ease of reading, we construct the y and f(x) scales on the vertical sides of a square and the k scale on the appropriate diagonal. In some cases it might be preferable to treat the quantity being measured as y and the instrument reading as x.

A straight line joining an instrument reading on the y scale to the corresponding known quantity measurement on the f(x) scale will cross the k scale at a point determined by Equation 3. Straight lines passing through this point and various values of instrument readings on the y scale will intersect the f(x) scale at values corresponding, respectively, to the quantities being measured.

Since the deflection of an optical manometer beam is almost directly proportional to the applied pressure, we have made the f(x) or pressure scale of our calculator linear (Fig. 1). For the sake of simplicity we plot no values on our k scale but employ it merely as an index line.

To use the calculator, we join a known value on the pressure scale with its corresponding value on the deflection scale by means of a straight hairline inscribed on a thin, transparent strip of cellulose acetate. The strip is then shifted along its long axis until one of a number of regularly spaced small holes drilled along the straight line exactly overlies the index line. A push pin pressed through this hole into the wooden base underneath serves as a pivot for further settings. To calculate other pressures registered by the same manometer, the cellulose acetate strip is rotated so that the hairline intersects the deflection scale at points determined by measurement of the manometer record. The readings of the hairline on the pressure scale will then yield the corresponding pressure values.

Although proportionality factors are readily set up on a slide rule, our calculator appears to possess certain advantages not obtainable in a slide rule: (1) The scales are large, uniform, and easily read. (2) The scales are "tailored" to fit the ranges of values in which we are interested. Thus, in passing from values of less than 10 to greater than 10, as frequently occurs in our records, it is not necessary to change the setting of the calculator as it would be when using the ordinary C and D scales of a slide rule. (3) The mechanical manipulation of our calculator, once a point on the index line has been established, is considerably simpler than with a slide rule. The advantages of this feature become apparent in the analysis of lengthy records. (4) Because there are no sliding scales in apposition, the scales of our calculator are easier to read than those of a slide rule. (5) The scales of our calculator are labeled specifically as to type and units of measurement. Thus, the tyro is able to grasp the significance of the scales almost immediately and can learn to use the calculator satisfactorily with a few minutes of instruction and practice.

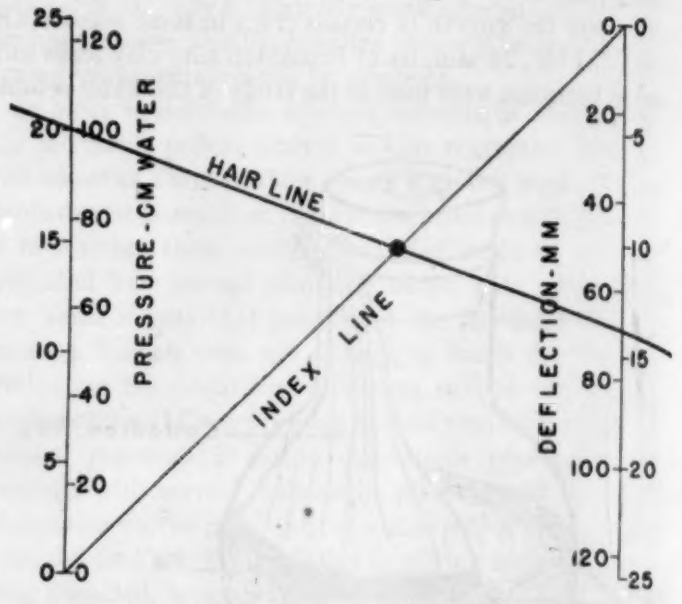

FIG. 1. Scheme of pressure calculator. Scales, plotted on millimeter paper, are 25 cm. long and 25 cm. apart. Usually the two outer or two inner scales are employed, and an index line setting for one pair of scales will serve for the other pair. Outer scales may be paired with inner scales, but individual index line settings must be determined for each of such combinations. Remainder of description is in text.

Other possible uses of this type of calculator are readily apparent. For instance, a linear f(x) scale would be useful for devices employing the strain-gauge principle. A quadratic f(x) scale should prove quite valuable in connection with flowmeters such as the orifice meter described by Gregg and Green (*1*). In other devices, such as the variable capacitator described by Lilly (*2*), f(x) cannot be expressed in simple mathematical terms, but suitable values for plotting the f(x) scale could be obtained from calibration of the instrument. Another form of this type of nomograph possesses linear y and f(x) scales, but the magnitude assigned to various points on the proportionality scale are k^2 rather than k (cf. Eq. 2). This constitutes a graphic representation of the law of inverse squares which we have found useful in calculating the correct photographic exposure for a given distance from a known exposure at another distance.

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A Concentric Glass Electrode Assembly for pH Measurements

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The electrode assembly described below, which can be made from materials usually available in laboratories, is believed to offer the advantages of good shielding and compactness.

In this design the stem of the glass electrode is placed within a slightly larger tube. The annular space between the two is filled with KCl solution and serves not only as the salt bridge of the reference electrode but also as an electrostatic shield. Such a concentric electrode assembly is particularly convenient for measuring the pH of samples in test tubes. Several electrode assemblies of this type have been built in which the outside diameter is less than 6 mm.

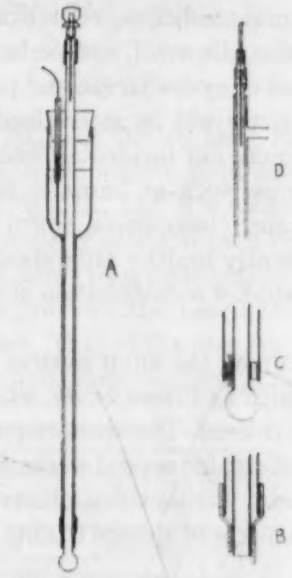

FIG. 1

In the type shown in A, Fig. 1, the annular space is closed at the bottom by a piece of Tygon tubing. This tubing is chosen to fit closely but without stretching over the stem of the glass electrode. It is then softened by steaming and forced over the end of the outer tube. The stem of the glass electrode just above the bulb is roughened on a coarse wheel or by filing (this may be done before the bulb is blown) to provide multiple fine channels through which the KCl can creep and establish a flowing junction with the sample to be measured. The outer surface of the stem of the glass electrode is wet with KCl solution and then slid up through the Tygon bushing. Assemblies which show only a very slow outflow of KCl have functioned satisfactorily. In time the Tygon may contract so as to cut off this flow, but this can be re-established by steaming the bushing in place and putting the lower end of the electrode assembly under gentle suction to draw KCl through.

Several modifications have been developed in this laboratory. A "window" type electrode may be protected by cutting the bushing diagonally and allowing one or more points to project below the delicate glass membrane (Fig. 1, B). In place of the Tygon bushing, a ring of gum rubber may be inserted between the stem of the glass electrode and the outer tube (C). Outflow of KCl is controlled by a tuft of fibrous material such as glass wool, asbestos fiber, etc., placed beneath the rubber ring before the electrode is inserted in the outer tube.

In Fig. 1, A, the KCl reservoir surrounds the stem of the glass electrode. Although this type is simple to make, it cannot be completely shielded, and electrical leakage through the stopper is apt to occur. In the design shown at D the reservoir is put at one side, connected either rigidly by glass or, if at some distance, by flexible tubing. The reference electrode is placed in this reservoir. The annular space for ½–1 inch above the side arm is filled with a mixture of half rosin and half beeswax. As this mixture is a good dielectric and forms a firm, moisture-tight bond with glass, the stem of the glass electrode needs only to extend far enough above the outer tube to fasten the Ag-AgCl electrode to it.

Electrical leakage to the reference electrode is practically eliminated, and, while supplementary shielding is easily accomplished, the short distance which the unshielded conductor is exposed usually makes it unnecessary.

Although no measurements have been made, electrical leakage through the stem of the glass electrode does not appear to be of much practical importance. Successful assemblies as long as 14 inches have been made using ordinary 7- or 8-mm. soft glass tubing for the stem. Heavy-walled barometer tubing has been used but appears to make no difference.

Other types of half-cells could probably be adapted for use with this arrangement, but the author has used silver strips plated with AgCl.

For the reference electrode these are conveniently made by soldering the silver strip before plating to a length of insulated copper wire. This is slipped into a glass tube which is then filled with the molten beeswax-rosin mixture so that the soldered joint is completely covered.

A similar strip may be used to establish contact with the buffered KCl solution within the glass electrode (D), or an insulated binding post (EBY Junior Post) can be used so that electrodes may be readily connected to a pH meter (A). The silver strip is soldered to the brass binding screw before being imbedded in wax. A Tygon collar holds the assembly in place and prevents evaporation of the solution in the glass electrode.

Staining of Oyster Larvae as a Method for Studies of Their Movements and Distribution

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The free-swimming larval period of the American oyster (*Ostrea virginica*) is of considerable duration, sometimes lasting several weeks. During this period the horizontal and vertical distribution of larvae may be controlled by tides, tidal currents, and other factors. Because of different ecological conditions, the behavior of the larvae in different areas may show considerable variations.

In conducting observations on the movements and distribution of larvae, investigators, as a rule, have had to deal with unknown populations, because no method had been developed to mark the larvae of known broods so that they could be easily identified in plankton collections. Such a method is offered here.

Experiments on developing a method for marking oyster larvae were begun in our laboratory in 1944 by Loosanoff and

Tommers. Thinking that eggs could be stained while still in the gonads of the oysters, so that they could later be normally discharged and develop as colored larvae, we placed oysters in solutions of nile blue sulfate and of neutral red. Although the gills and palps of the oysters were deeply stained, the color of the eggs remained unchanged.

The next step consisted in staining unfertilized and fertilized eggs with the same two dyes. They stained well, but, because both stained and control individuals soon died, it was impossible to ascertain the real value of the method. Lack of time and lateness of the season prevented continuation of the experiments. These were, however, resumed by the writers in 1947, the following stains being used: alizarin red S-7, Janus green, neutral red, nile blue sulfate, and trypan blue. They do not, of course, exhaust the list of vital stains that may be tried for this purpose.

The eggs and larvae treated with trypan blue and alizarin red S-7 survived and continued their development, but even after long exposures to these stains the color was too light to be of value in distinguishing stained from unstained individuals. Janus green, generally used for vital blood staining, quickly killed the eggs and larvae. Nile blue sulfate also gave unsatisfactory results because, although the eggs and larvae acquired a deep-blue color, their development was quickly stopped and usually they soon died. In one instance only, the organisms stained as trochophores developed into veligers, *i.e.* the straight-hinge-stage larvae. These, nevertheless, soon died.

In experimenting with neutral red we found that satisfactory results can be achieved, regardless of whether eggs, trochophore, or straight-hinge larvae are used. Staining did not interfere with fertilization. After the addition of sperm, the stained eggs developed normally, the progress of the development was the same as in control eggs, and the mortality was no higher.

In some experiments the oysters were allowed to spawn in a solution of neutral red. The eggs were later fertilized and proceeded to develop normally at the same rate as the control.

The trochophore larvae, developing from the eggs treated with neutral red before or after fertilization, showed a deep-reddish color over their entire surface. After developing into the straight-hinge stage, the larvae still were deeply stained, the color being most intense along the edges of the mantle. Later on, the color became concentrated in several comparatively large areas of their bodies. About 11 days after they were stained as eggs, the larvae were still easily distinguishable from the controls by a large red spot near the stomach.

Trochophore larvae, stained 12 hours after fertilization, developed into normal straight-hinge larvae. They retained the red color the same as the larvae which developed from stained eggs. However, the veligers stained in the trochophore stage retained the color somewhat longer than those which developed from the eggs stained before or soon after fertilization.

In staining young veligers we noticed a certain inconsistency in the results. As a rule, the larvae concentrated the stain in a comparatively large area near the stomach, while the other parts of the body remained almost unstained. On a few occasions, however, the stain was generally distributed through the body, being most intense in the velum and along the edge of the mantle. In either case the stained larvae were easily distinguishable from the controls for a period of at least 10 days.

Older veligers, some as large as 300 μ, were also stained with neutral red. However, although the velum and other parts of the body, such as the mantle, became deeply stained, it is doubtful, because of the dark color and relative thickness of their shells, that they could be easily identified in preserved plankton collections.

In our opinion, the best stage for staining is the trochophore larva. Under laboratory conditions fertilized eggs can be carried to that stage without much difficulty. After staining, the trochophores may be released and should soon reach the early veliger stage.

To stain eggs or larvae we kept them for approximately 20 minutes in a solution of 1 mg. of neutral red in 1 l. of sea water, after which the water was either changed or greatly diluted. Of course, many variations of the method are possible by prolonging the time of exposure or by using stronger concentrations. However, in each case it should be ascertained whether the variation of the method would result in heavy mortality of larvae.

The method offered here presents rather broad opportunities for studies, under natural conditions, of vertical and horizontal movements, distribution, dispersal, and perhaps even the rate of growth and survival of oyster larvae and probably of other lamellibranchs. The latter will be ascertained by our experiments next year. Because our incidental observations showed that many other forms, such as barnacle larvae, copepods, many other crustaceans, ctenophores, worm larvae, etc., remain alive and apparently healthy after staining, the method may also be used for studies of distribution of a wide variety of plankton forms.

Incidentally, in staining the adult oysters we noticed that the boring sponges, such as *Cliona celata*, which inhabit their shells became deeply colored. The sponges retained the stain, especially nile blue sulfate, for several weeks and showed no ill effects of the treatment. Perhaps this observation could find application in some aspects of sponge studies.

A Precision Micro-Pipette Trimmer

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The need for a precise and easily used tool for trimming the micro-pipettes and micro-needles used in micrurgical studies is apparent to all students in this field of investigation. Belkin (*1*) designed a micro-guillotine for this purpose to be used with a Chambers micromanipulator, but the instrument appears not to be adjustable and requires some dissembly of the two-movement manipulator setup. The present paper describes a simply constructed and efficient instrument for trimming micro-pipettes and micro-needles for use with the Chambers (*2*) micromanipulator.

The instrument may be made of plastic or brass. The bulk of the instrument consists of two fitted flat jaws: a U-shaped rear jaw (Figs. 1A, 2A) and a rectangular-shaped front jaw (Figs. 1B, 2A) fitted between the arms of the rear jaw. The two jaws are held in mutual position by two guide bolts (Fig. 1C) which pass through counter-sunk channels drilled through the back edge of the rear jaw and which are screwed into the

[1] I would like to extend my thanks to Ernest F. Hiser, of our Art Department, for the preparation of the illustrations and also to our Pharmacology Department for making its machine tools available to me.

apposing edge of the front jaw (Figs. 2A, 2C). The guide bolts function only to facilitate the general handling of the instrument and to limit the extent to which the jaws may be opened. A centered groove ½ inch wide by $\frac{5}{16}$ inch deep, extending the length of the front jaw and coinciding with a similar but short groove in the apposing edge of the rear jaw, forms a pipette-

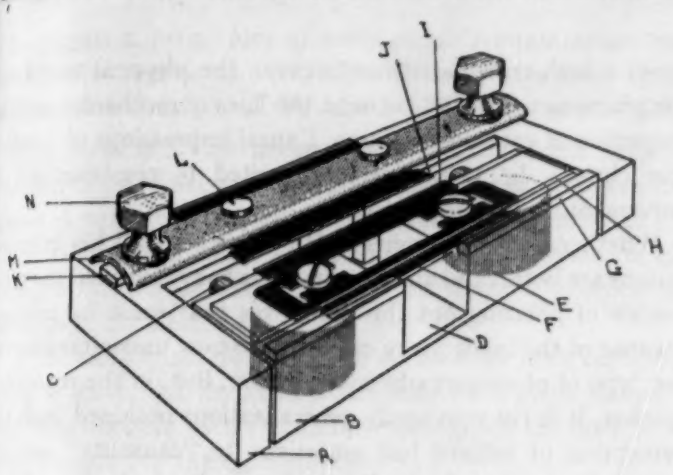

FIG. 1

run (Figs. 1D, 2B). An Alnico steel instrument magnet is cemented into an appropriately sized hole drilled in each half of the front jaw (Figs. 1E, 2A). A standard double-edged razor blade (Fig. 1F) properly oriented by a fixed blade stop (Figs. 1G, 2C) and held down by a clear plastic plate (Figs. 1H, 2C) with two screws provides the functional cutting edge (Fig. 1I) of the front jaw. That of the rear jaw (Fig. 1J) is also provided by a standard, double-edged razor blade. This blade

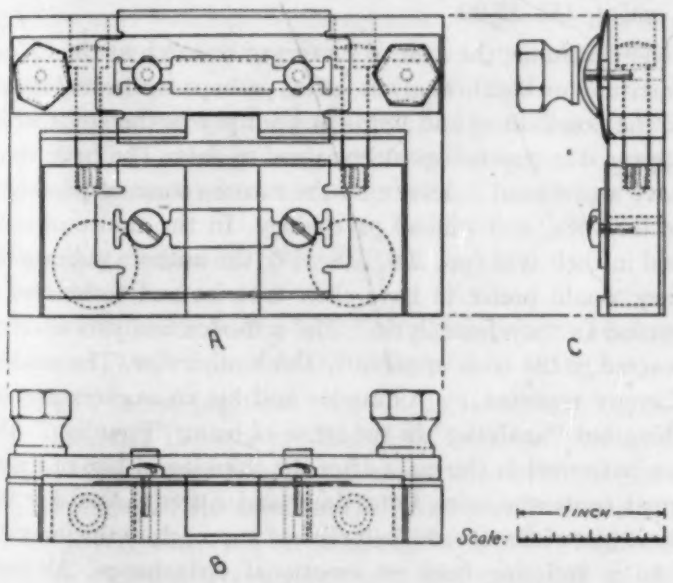

FIG. 2

rests on the top of a narrow ridge (Figs. 1K, 2C) consisting of a plastic strip cemented across the basal part of the rear jaw. The blade is oriented with its functional cutting edge paralleling that of the front jaw by two posts $\frac{3}{16}$ inch in diameter, screwed into the ridge and rear jaw (Figs. 1L, 2A, 2B). The blade is held in position by an arched metal plate (Figs. 1M, 2C) controlled by two thumbscrews (Figs. 1N, 2). By turning the thumbscrews, the arched plate raises or lowers the functional cutting edge of the rear razor blade. This makes it possible to align the cutting edge of the rear jaw with that of the front jaw for maximal cutting efficiency.

It will be noted from study of the construction plan (Fig. 2) that the width and length of the instrument, even with the jaws wide open, and the height of the pipette-run are the same as those of the standard moist chamber used with the Chambers micromanipulator (*3*). Thus, when one with his micromanipulator assembly completely set up finds it necessary to trim the micro-tips, he needs to remove only the moist chamber from the assembly by the usual procedure without disturbing the centered micro-pipettes and to substitute in its place the micro-trimmer with the open end of its pipette-run facing the micro-pipettes. The micro-trimmer is moved forward by the mechanical stage until the two functional cutting edges (which will be closed by this maneuver) are brought into the field of the microscope. The cutting edges are then separated from each other by racking the mechanical stage slightly back. In this maneuver it will be observed that only the real rear cutting edge is moved by the mechanical stage. For this reason, it is referred to as the mobile cutting edge. The real front cutting edge, being quite firmly held by magnetic attraction to the microscope stage, remains stationary and is referred to as the stationary cutting edge. Thus, slight backward and forward racking of the mechanical stage opens and closes, respectively, the functional cutting edges. With the cutting edges almost closed, the mobile cutting edge is lowered by means of the thumb-screw controls until it can just pass above the stationary one. When the cutting edges are satisfactorily aligned, they are opened as indicated above. By means of the micromanipulator controls, the already centered micro-tip which is to be trimmed is elevated to the desired level above and rested against the stationary cutting edge. The mobile jaw is then closed. This closure shears the micro-tip off at precisely the level of the stationary cutting edge. After the pipette has been trimmed, it is lowered by the appropriate micromanipulator control to a position beneath the stationary cutting edge. The micro-trimmer is then removed from the manipulation assembly without disturbing the centered micro-pipettes just as though it were a moist chamber. The moist chamber initially removed is put back into its original place in the complete micromanipulation assembly.

The detailed measurements necessary for the construction of the micro-trimmer may be accurately obtained by applying the 1-inch scale in Fig. 2 to the construction plans (Figs. 2A, 2B, 2C).

In fitting the jaws and the guide bolts, it is essential to reduce all friction to a minimum; otherwise, the magnets cannot satisfactorily immobilize the front jaw at the appropriate times in operational use.

If cylindrical magnets are set into the front jaw, care must be taken to avoid getting like magnetic poles of the two magnets at the same jaw surface. This is necessary, since the complete magnetic circuit when on the microscope is: N-pole of 1st magnet—microscope stage—S-pole of 2nd magnet—N-pole of 2nd magnet—front razor blade—S-pole of 1st magnet. Preferably, any small but powerful instrument magnet of a modified horseshoe shape may be used if its dimensions do not exceed 15 mm. in diameter and ⅝ inch in height.

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Book Reviews

Estimation of the vitamins. (Biological Symposia, Vol. XII.) W. J. Dann and G. Howard Satterfield. (Eds.) Lancaster, Pa.: Jaques Cattell Press, 1947. Pp. xiv + 531. (Illustrated.) $6.50.

There are about 15 vitamins which have been clearly characterized and which are of importance directly or indirectly to man. From one to many methods have been proposed for the estimation of each of these in food and biological fluids. Descriptions of these many methods are widely scattered in the scientific literature, some of them are but slight variations of others, many are of questionable merit or of limited application. The time is more than ripe for a critical evaluation of the situation. This has been done in a thorough and competent manner in this new book, which should be in the library of anyone interested in the estimation of the vitamins.

Each of the 29 chapters which the book contains is written by a contributor who has had intimate experience with the subject. The editors have done unusually well in their selection of contributors, and the authors have done unusually well with their assignments.

Available methods based on biological, microbiological, and physical and chemical principles are included. In each case a recommended method is presented along with a critical discussion of the details of the method, its limitations and merits. This is a book which should find wide and heavy use.

OTTO A. BESSEY

The Public Health Research Institute of The City of New York, Inc.

La perception de la causalité. A. Michotte. Louvain: L'Institut Supérieur de Philosophie; Paris: J. Vrin, 1946. Pp. viii + 296.

It is with a certain feeling of excitement that one begins the reading of a book with a title as intriguing as *The perception of causality*, written by a distinguished psychologist.

In his experimental technique, Michotte takes off from the classic example of causality used in philosophic discussion—the impact of one billiard ball on another. To find out what are perceived as "causal phenomena," he used a projection technique in which two disks could be observed behind a screen in various relations to each other. Variations in speed, distance, angle, temporal, spatial, and kinetic order were controlled to determine the conditions and limits of what were perceived as causal relationships.

Whether or not a person experiences a "causal impression" is held to be entirely a matter of the structural organization of the perceptive field, of the intrinsic properties of stimuli organized in certain spatial and temporal relationships. The author relies heavily on Gestalt psychology and believes that "the perception of causality is as 'objective' as all other perceptions."

What he terms the "generative aspect of causal impression" is also a phenomenal given. Luckily for man, he says, there exists a high correspondence between the physical world and the phenomenal world, between the laws of mechanics and the properties of causal impression. Causal impressions of qualitative change, he maintains, are limited to combinations of movement or changes of form.

Whether or not one agrees with Michotte that his interpretations are both valid and adequate, he has performed the great service of pointing out the paradoxes that must be resolved because of the inadequacy of our up-to-now understandings of the type of phenomena he investigated. But, in the reviewer's opinion, it is risky to apply generalizations obtained from the perception of billiard ball situations to "causality" as conceived when we try to understand an individual who exhibits purposive behavior, who initiates voluntary actions, and who makes value-judgments in his effort to modify in the present the causes of what he foresees as future effects.

ADELBERT AMES, JR.

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Psychoanalytic therapy. Franz Alexander, Thomas Morton French, *et al.* New York: Ronald Press, 1946. Pp. xiii + 353. $5.00.

This volume, the fruit of 7 years of research at the Chicago Institute for Psychoanalysis, offers perhaps the best statement of the possibilities and limits of brief psychotherapy that has appeared in psychological literature to date. The book should have a profound influence on the future course of psychiatry, social work, and clinical psychology. In the choice of a title and in their text (pp. 208, 338–339), the authors indicate that they would prefer to have their theories and techniques regarded as "psychoanalytic." The orthodox analysts who have reacted to the book apparently think otherwise. The modes of therapy reported by Alexander and his co-workers are anything but "analytic," in the sense of being "Freudian." They are patterned in the main after the thinking of two of Freud's great contemporaries, Otto Rank and Alfred Adler. For their dynamics of *therapy*, or their clinical approach to the individual who is suffering from an emotional disturbance, Alexander and his colleagues are indebted for the most part to Rank (pp. v, 22–23). As for their dynamics of *personality*, or their theories of the structure of neuroses—which the therapist must grasp quickly if he is to make a success of shortened psychotherapy (pp. 11, 172, 262–263)—the Chicago group would seem to be Adlerian through and through. (Such is the conclusion one is forced to draw after making a close examination of the volume's excellent case histories.) The Chicago Institute for Psychoanalysis is not alone in this seeming rediscovery of Rank and Adler. Psychiatry and clinical psychology as a whole seem to be drifting in the same direction. Adler has come to life in other vigorous circles, notably in the publications of the "Horney" school. The fertile Philadelphia School of Social Work owes its orientation to Rank. Rank is also the father

(who might have some difficulty recognizing his child) of the nondirective therapy which is the accent of the moment in a good many of our university departments of clinical psychology.

KEITH SWARD

Beverly Hills, California

The physical principles of wave guide transmission and antenna systems. W. H. Watson. Oxford, Engl.: Clarendon Press, 1947. Pp. xiii + 208. (Illustrated.) $7.00.

This book is an advanced text intended for the research engineer or physicist who is specializing in the subject of microwaves. A very good background in mathematics is necessary in order to understand the book fully. However, the author has included much information which is the result of practical experience in the field.

In the early chapters the author reviews the basic equations of plane wave, slab line, and rectangular wave guide transmission. Matrices are used extensively throughout the book in an effort to simplify the mathematics.

In Chapter III there is a practical discussion of microwave measurements.

Babinet's principle is used as a basis for computing the effect of obstructed propagation in wave guides. Gratings, irises, slots, and other discontinuities which are found in wave guide work are all treated in considerable detail. The author has devoted much space to an excellent treatment, both theoretical and practical, of various types of slots in wave guides, guide coupling by slots, and wave guide arrays. Wave guide slot arrays were a wartime development of McGill University, where the author was working. Cavities, phase changers, magic-tees, and some more of the later developments in microwave work are touched upon.

The book makes a real contribution to the microwave field in that it will do much to bring the research worker up to date in several phases of microwave techniques.

LA VERGNE E. WILLIAMS

University of Connecticut, Storrs

Basic botany. Fred W. Emerson. Philadelphia-Toronto: Blakiston, 1947. Pp. xi + 372. (Illustrated.) $4.00.

This is a refreshing new textbook of elementary botany which continues the recent trend away from the ponderous and sometimes pedestrian tomes characteristic of so many books for students. The departure from the conventional starts with the cover, which is a landscape scene in color from New Mexico or vicinity. The arrangement and treatment of the subject matter, while not so startling, is sufficiently different to be challenging to those familiar with the more orthodox texts. The author's style is fresh and unstilted, the illustrations adequate and often admirable, and the scope the usual one of morphology, physiology with chapters devoted to genetics and evolution, plus excellent sections on plant classification, ecology, and conservation.

Criticism of the text can be made on two minor points. The author plainly considers evolution to be a law, as it is, but persists in calling it a theory. The other criticism is directed at the drawings of mitosis, in which there appears a spindle figure in prophase, an error perpetuated in most botany texts, diagrams, and charts. In the excellent text description of the process, however, no mention is made of the appearance of a spindle before the disappearance of the nuclear membrane. In the preface, the author states as his conviction that both students and teachers learn, study, and investigate under the drive of significance, and that freshness and spontaneity should characterize the atmosphere of classroom and laboratory. It is good to hear of a botanist who believes in his subject, and one finds in this book none of those desperate attempts to justify the business usually entitled 'why study botany.' Those who confuse measured monotony with scholarship will probably not like this book.

EARL H. NEWCOMER

University of Connecticut, Storrs

Physical chemistry. E. D. Eastman and G. K. Rollefson. New York-London: McGraw-Hill, 1947. Pp. viii + 504. $4.50.

This text is "designed to meet the requirements of the year course in physical chemistry usually presented to third- or fourth-year college students and to serve as a reference book in later work." The authors have written for mature students and have, I think, achieved their purpose admirably.

Three introductory chapters explain the objectives and methods of physical chemistry and define such terms as *system*, *conditions*, *potentials*, *components*, *changes in state*, etc. This should give the student a perspective that often comes only after the course is nearly over; as a preview, these chapters evince a keen pedagogical insight. The range of topics in the remaining 23 chapters is fairly conventional, but the rigorous treatment and fine writing give them an unusual vitality. For example, Chapter IX, "Energy and Heat Capacity of Gases and Crystals," is a well-integrated account of classical and modern views ranging from the work of Clément and Desormes in 1819 to Raman's contributions in 1941. In Chapters VIII, X, and XII are presented the current ideas on the structure of solids and liquids; although these 68 pages are mostly descriptive, they have a high intellectual specific heat. The important chapters on thermodynamics, equilibrium, and kinetics are remarkably free of that most common fault of elementary texts—the failure to distinguish between exact and approximate relationships. An example of this kind of error occurs in applying the First Law to processes taking place under constant pressure or constant volume. The authors distinguish the energy changes by the use of subscripts in the terms ΔE_p and ΔE_v, but this distinction is subsequently ignored in the statement (p. 45) that the difference between the heats of reaction at constant pressure and at constant volume is always calculable from the equation: $\Delta H_p = \Delta E_p + P\Delta V$. Although $\left(\frac{\partial E}{\partial P}\right)_T$ is relatively small, thermochemists do measure it, and it is unfortunate that nearly every popular text treats this fundamental subject incorrectly. A similar oversimplification occurs in Chapter XXI, where the equilibrium constant for the reduction of ferric iron by iodide is calculated from electromotive force data. It should be emphasized that, in actual systems encountered by the student, the presence of phosphates or fluorides can result in the quantitative reversal of the equilibrium predicted. Later in the same chapter, a beautiful graphical picture of the effect of ionic strength on a similar equilibrium of ferric-ferrous iron should make the alert student ask questions about the former.

On the other hand, we can easily find many places where the authors show exceptional care. In discussing the hydrolysis of bicarbonate ion, they point out that either of the simplifying assumptions made in calculating the pH gives an answer far different from the experimental value. By any standards this text should join the highest rank of its kind. The content of the book reveals a mastery of the subject, and the style in which it is written reveals the beauty. The typography is excellent, but the thin paper will probably not stand hard use.

ROBERT EPPLE

Brown University

Electric contacts. Ragnar Holm. Stockholm: Almquist & Wiksells, 1946. Pp. xvi + 398. (Illustrated.) 45:-.

Electric contacts have an important role in modern living. However, the physical principles of contact phenomena have not been correlated fully with experimental data. Present knowledge is confined largely to well-guarded production techniques and empirical formulas that the industry has amassed. This book is an attempt to describe in general terms the physics of contacts and to develop fundamental formulas in agreement with data taken by the author and colleagues over a period of some 20 years.

As noted in the text, the book was written while the author was a physicist in the Research Laboratory of the Siemens Works in Berlin, one of the outstanding industrial laboratories on the continent between the first and second World Wars. Translation of the book into English introduced some minor errors in spelling and terminology, but these in no sense lessen its technical value.

The style used by the writer is a balance of thoroughness and clarity. He begins with a complete list of symbol definitions and a qualitative résumé of the major conceptions used throughout the work. Such an introduction is necessary, because many of the symbols and terms used either have not received universal recognition or are used here to introduce new concepts, e.g. "constriction resistance" and "coherer action."

Stationary contacts are considered in Part I. The general theory of contact surfaces and contact resistance is treated in some detail. This is followed by a theoretical analysis of the interrelation between electric potential differences, temperature gradients, and impedance in contacts. The role of electrodynamic and electrostatic forces is outlined. The influence of pressure and tarnish films on contact resistance is carefully described. Tables and plates are interspersed that in the main confirm, but at times are not in full agreement with, the theory. The author goes to some lengths to point out that in many instances only the results of preliminary investigations are available, and that more detailed research is necessary before useful formulas can be evolved.

Part II is a study of sliding contacts. The concept of friction and its effect on contact resistance is treated in considerable detail. The relative physical properties of several combinations of contact materials are presented in detailed tabular form with a commentary on the observations.

Part III begins anew with a survey of the short switch arc, including a study of the VI-relationship, bouncing, oxidation, arc duration, and methods of quenching and suppression. The physics of contact erosion and transfer of matter are very clearly presented with substantiating data.

Part IV, a retrospect, is purely historical. Going back to the early experiments of Franklin and Leyden, it traces the evolution of the concept of contact resistance to the present day. A very complete author and literature index is included.

As a whole, the book is written on a plane that will qualify it as a reference text for graduate students in electrical engineering or as a handbook for industrial design engineers. Some parts of the text, printed in brevier, are intended primarily for the physicist and afford a prolific ground for the selection of problems for fundamental and applied research.

MERLE H. BRAGDON

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Servomechanism fundamentals. Henri Lauer, Robert Lesnick, and Leslie E. Matson. New York-London: McGraw-Hill, 1947. Pp. xi + 277. (Illustrated.) $3.50.

The fundamental principles of servomechanisms are so presented in this book as to require a minimum background in mathematics and physics. A chapter on the fundamentals of mechanics and electricity is included, and the necessary differential equations are presented and solved in detail by classical methods. Thus, considerable review of the necessary background material is provided in the book itself.

The fundamental servo control system is developed, and its essential components are pointed out. These components are an error-detecting device which compares the actual output quantity with a given input requirement, and a controller embodying the necessary amplifiers and motors to cause the output to correspond to the input requirement. The need for damping and stabilizing devices is also pointed out. The more common error-detecting devices such as synchros are discussed fully, and several examples of servo systems are given.

The transient responsé of various typical servomechanisms is studied by means of classical differential equations. First, a system with a proportional controller whose only damping is the viscous friction of the output member is considered. This system has the disadvantage of a steady-state error if the input is a constant velocity. This undesirable error is found to be absent if all the damping is produced in the controller by means of an additional effort proportional to the rate of change of error. Systems with error-rate damping and combined damping are then studied. Networks for producing this error-rate stabilization are also discussed. Elimination of the steady-state error by means of integral control is then discussed, and systems with integral control are studied. Networks for producing integral control are also included.

The response of servo systems to a sinusoidal input function is mentioned in various places in the text, and a chapter near the end of the book gives an introduction to the frequency response or transfer function analysis. Nyquist's stability criterion is stated, and various plots of the transfer function are given. This chapter serves as an introduction to the more advanced treatises using this method of analysis.

Although the book has many excellent solved examples and one chapter treats typical design calculations, it is felt that its value as a textbook would be increased by the addition of a number of well-chosen problems.

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